MEDDELELSER OM GRØNLAND

UDGIVNE AF

KOMMISSIONEN FOR
LEDELSEN AF DE GEOLOGISKE OG GEOGRAFISKE
UNDERSØGELSER I GRØNLAND

BIND LVIII

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KØBENHAVN
C. A. REITZEL, BOGHANDEL
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INDHOLD

ARBEJDER FRA
DEN DANSKE ARKTISKE STATION PAA DISKO Nr. 11

I.

THE FLORA OF DISKO ISLAND AND THE ADJACENT COAST OF WEST GREENLAND

FROM 66°—71° N. LAT.

WITH REMARKS ON PHYTOGEOGRAPHY, ECOLOGY, FLOWERING, FRUCTIFICATION AND HIBERNATION

BY

MORTEN P. PORSILD

ASSISTED BY

A. ERLING PORSILD

FIRST PART

1920

PREFACE.

In 1898 I took part in the late Dr. K. J. V. Steenstrups expedition to Disko Island, in which it was my task to study the vegetation in the localities visited by us. In the report of my work (Porsild: Bidrag 1902) an account was given, for instance p. 229 ff., of the remarkably large southern flora-contingent which is found on the south coast of this island. In 1902 I was dispatched again by the Committee of Geological and Geographical Investigations of Greenland to study the vegetation in the relatively less-known northern part of the island which we did not reach the first time. The result of this journey was proportionately larger owing to my somewhat larger practice and experience, but, nevertheless, it did not modify my impression of South Disko's remarkable floristic peculiarities.

In the following years the results were revised, and in 1905 the report was finished and might have been delivered to the Committee for publication. But then the preparations for the establishment of the Danish Arctic Station on Disko intervened, and, in 1906, when the station was guaranteed, I wanted to take the finished MS. with me to Greenland to supplement it further during my intended stay there. The Committee most kindly agreed to this for which I here offer my sincerest acknowledgement.

Although South Disko, especially the vicinity of Godhavn where I am living at present, is botanically by far the best known locality in Greenland, it became apparent all the same, that it still offered fresh opportunities for research, and this circumstance by itself naturally suggested to me that the adjacent parts of West Greenland might want a further investigation before the floristic characters, which distinguishes them from Disko, were defined more precisely. I have therefore used what time I could spare from other work in the summers of 1906—1918 in such investigations, partly in the island of Disko, partly on the main land to the north and south of Disko. About some of these investigations (Hare Ø, the South- and West coast of the Nûgs-

suaq Peninsula from 71° to 73° N. Lat.) I have already published reports (see bibliography), the others are published here for the first time.

In publishing this work, which sums up everything known about the distribution of the higher plants on Disko and the adjacent parts of W. Greenland, I am far from supposing that no new discoveries can be made. The country is so vast, the means of communication so primitive, and the summer so short, that, in spite of all care, I have only succeeded in investigating a small part of it thoroughly; but the obligations of my official work compel me for the time being to finish and to offer to the public my results in as complete a state as circumstances have permitted me.

As an investigation of the flora of Disko was originally my sole aim and always in this connection my chief object, I have throughout the following list kept it by itself. And as the flora of Disko, as already mentioned, has been oftenest examined, a more detailed account of the growth of our knowledge of the flora in a separate arctic region may be justified, as from this conclusions can be drawn, to a certain extent, concerning the greater or lesser reliability of results from other arctic regions when used as a basis for more extensive plant-geographical discussions.

Historical survey of the botanical investigations on the Island of Disko.

Owing to the easy access to the harbour of Godhavn and also on account of the importance of this settlement as the head-quarters of the Royal Inspector of Danish North Greenland, Disko has become the most frequently visited locality of Greenland. Besides the Danish travellers, nearly all North-Polar Expeditions through Davis Strait have anchored here and plants have been collected. With few exceptions however, only the vicinity of the settlement has been studied.

In the following I shall endeavour shortly to characterize the importance of each contribution or, in other words to give the history of our knowledge of the higher plants on Disko, however leaving aside the scanty contributions to the flora of Greenland from the 18th century, as surely very few of them have been brought home from that island.

During his journeys in 1806—13 for the Danish Government, the famous mineralogist C. L. Giesecke spent much time in the exploring of Disko, where he, at different times, visited the Disko-Fjord, the South Coast, parts of the Vajgat and the North Coast. He also incidentally collected plants, and gave in his article »Greenland«, in Brewsters »The Edinburgh Encyclopædia 1816« a list of plants observed in Greenland, but without any mention of special localities. His diary, of which the main parts were published in 1878 by Johnstrup, also contains numerous notices of plants collected or observed. But Giesecke's identifications are only partially to be relied upon, and Lange did not revise the collection of Giesecke till 1887 (see below).

The richest collections of plants ever brought home from West Greenland by one collector, were made by Jens Vahl, who, sent by our Government, spent 8 years in Greenland and who, during the years 1833—36 visited several times the neighbourhood of Godhavn. Unfortunately this able and thoroughly scientifically trained botanist

never came to publish his results; he only distributed sets of duplicates with printed labels, giving the distribution of the vascular plants, from 60° to 72°48′ n. Lat. At his death in 1854 he left, besides extensive diaries, a nearly completed MS. with full descriptions of all plants known to him as occurring in Greenland, but these MSS., that together with the collections of VAHL are in the possession of the Botanic Garden at Copenhagen, have never been published. Only some new forms, found by VAHL have been incorporated in the »Flora Danica« together with figures and short diagnoses of them.

In 1857 JOH. LANGE gave a list of plants of Danish Greenland as an appendix to H. RINK: Grønland, statistisk og geographisk beskrevet vol. II[1]. The list is chiefly based upon the collections of VAHL and RINK and on the information given by the former on his written and printed labels. Special localities are only stated for the rarer species, the distribution of the common ones is stated by indicating the parallels of their southern and northern limit, as found by VAHL.

According to this list, VAHL has found on Disco between 135 and 155 species[2]. Amongst the species here recorded from Disco one statement seems to be erroneous, viz. *Anemone Richardsoni* (see the notes for this species in my list below).

During PENNY's voyage some plants were gathered by P. C. SUTHERLAND; a set of them, named by W. J. HOOKER was given to J. DICKIE, who published them together with a small collection brought home by INGLEFIELD (see his book: A Summer Search for Sir John Franklin 1853 p. 135). From Disko 11 species are recorded.

During BELCHER's expedition a collection of plants was made by LYALL; they were determined and published by J. D. HOOKER (Journal of the Proc. of the Linn. Soc. Botany vol. I 1857 p. 114) who records about 56 species from Disko. Of the rarer species, *Habenaria albida* deserves special mention, because up to that date it had not been found so far north. The following statements are without doubt erroneous: *Larbrea uliginosa* (= Stellaria longipes), *Gnaphalium sylvaticum* (= Gn. norvegicum), *Arenaria rubra* (= ?).

On KANE's voyages plants were collected at various places in Danish Greenland as well as near Smith Sound. In the list given by DURAND (Appendix No. XVIII to E. K. KANE: Arctic Exploration: The Second

[1] Reprinted in the German and English editions of this work.

[2] The number of species named in the following notes is always based upon the limitation of the species accepted by me; the numbers given in the original papers are therefore often somewhat altered here.

Grinnell Expedition etc. vol. II Philadelphia and London 1856) some 25 species are recorded from Disko. However it has been pointed out by several authors[1] that some confusion must have arisen as to the statement of provenience of the different specimens, southern plants being recorded from northern localities, the latitude of the stations not given exactly etc. To an error in the opposite direction the record of *Saxifraga flagellaris* from Disko, is due. As no erroneous determination of such an easily recognizable high-arctic species seems possible, the specimen in question must have been collected at some station near Smith Sound. As to the described new variety of *Ranunculus aquaticus* I shall refer the reader to my list, and leaving the *Drabas* out of discussion, the remaining species from Disko are all very common plants.

During whaling cruises 1856—61 J. Taylor several times visited the southern coast of Disko and collected plants there. He published in 1862 a list of his collections from both sides of Davis Strait and from Baffins Bay. (Trans. Bot. Society of Edinburg vol. XVI p. 76—87). Besides 21 very common species of which no special localities are named, 19 species are recorded especially from Disko. Two of his statements are erroneous, viz. *Andromeda polifolia* and *Colpodium latifolium* of which the author says that they are »common on both sides« (see my list No. 32 and remarks on Andromeda).

Dr. Walker, surgeon to M' Clintock's expedition, collected plants from the following places in Danish West Greenland: Frederikshaab, Godthaab, Disko (ɔ: Godhavn), Fiskemær and Upernivik. The locality »Fiskemær« is unknown to me; although its position is stated to be north of the polar circle, I should be inclined to believe that the name is a misreading of that of the settlement of Fiskernæs at 63°5′. And this supposition is supported also by the record of *Potentilla tridentata* and *Thymus Serpyllum* from »Fiskemær«, both being common in South Greenland, but very scarce north of the polar circle.

The list published by J. D. Hooker (Journ. of the Proc. of the Linn. Soc. Botany vol. V 1861 p. 79) records some 47 species found on Disko, of which: *Poa nemoralis and Equisetum silvaticum* are especially interesting, their occurrence on Disko not having been verified by later collectors.

Rob. Brown (of Campster) published 1868 his well-known »Flora Discoana« (Trans. Bot. Soc. Edinburg vol. IX) and mentions about

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[1] for instance see A. J. Malmgren: Botaniska Notitser 1865 p. 169; A. G. Nathorst: Öfv. K. Vet. Ak. Förh. 1884 Nr. 1.

22 species collected by himself near Godhavn or on the Vajgat shore near Ũnartoq and Qutdligssat; only one of them needs especial mention, viz. *Potentilla tridentata* from Lyngmarken; as it has not been found here by the numerous other botanists who have visited this locality, the statement seems erroneous[1]. Far more interesting are the instructive descriptions given by this author of the general character of the vegetation around Godhavn.

SV. BERGGREN, member of NORDENSKIÖLD'S expedition of 1870, collected plants in the vicinity of Godhavn and gave in 1871 (Öfv. K. Vet. Ak. Förh. 1871 No. 7) an excellent description of the vegetation of the localities visited by him. A systematically arranged list was not published, but in the above named paper, the following species are for the first time recorded from Disko: *Dryopteris Linnaeana*, *Calamogrostis neglecta*, *Carex capitata*, *Juncus trifidus*, *Luzula nivalis*, *Sagina saginoides*, *Melandrium apetalum*, *Draba arctica*, *Ranunculus sulfureus*, *Epilobium palustre*, *Pirola secunda*.

In 1871 TH. M. FRIES made still more valuable collections. He not only collected on the south coast, but he also visited the fjords on the western side and the then botanically unknown north and Vajgat coast of Disko. As far as I am aware, FRIES never published his vascular plants from Greenland himself, but they have been incorporated in the »Conspectus« of LANGE 1880 and in its first suppplements of 1889.

Of plants collected by FRIES, the following were new to the flora of Disko: *Potamogeton filiformis*, *Calamogrostis purpurascens*, *Dupontia Fisheri*, *Poa abbreviata*, *Puccinellia Vahliana*, *Puccinellia angustata*, *Agropyrum violaceum*, *Cobresia Bellardi*, *Cobresia bipartita*, *Carex incurva*, *Carex pedata*, *Carex capillaris*, *Corallorhiza trifida*, *Minuartia stricta*, *Arabis arenicola*, *A. Holboelli*, *Braya purpurascens*, *Draba incana*, *Lesquerella arctica*, *Potentilla Frieseana*, *Euphrasia arctica*, *Taraxacum phymatocarpum*, *T. groenlandicum*.

H. C. HART, naturalist to the British Polar-Expedition of 1875—76 made rich collections of plants on the south coast of Disko, during a week's stay here. In his paper (Journal of Botany, New Series vol. IX 1880) he gives p. 54—55 a short account of the general character of the vegetation and in his list he records some 87[2] species from this

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[1] After this was written. H. G. SIMMONS has shown l. c. p. 470 that the specimens of BROWN are *Sibbaldia procumbens* with a small fragment of *P. tridentata*. But as BROWN has collected at Christianshaab, where the latter species occurs, it seems probable to me, that the uniting of the two plants is due to some confusion.

[2] According to my enumeration; HART himself gives the number as 119 species.

island. Of the most interesting he emphasizes the following, of which he says, that they have not previously been found on Disko:

Ranunculus affinis, (this statement seems very doubtful to me, it is according to my opinion nothing but a form of *R. nivalis*).

Draba alpina var. *glabra*.

Cerastium latifolium, without doubt a mistake for a form of *C. alpinum*.

Gnaphalium sylvaticum (already reported by HOOKER as collected by LYALL); this species has never been found in Greenland, and HART must have mistaken a form of *Gn. norvegicum* for it, although he also mentions this species[1].

Habenaria albida Br. Of this HART says: »Not recorded north of 64°14′ by LANGE, nor noticed by BROWN, nor it is given in WALKER's plants of Greenland, nor in DURAND's list of KANE's plants«. All these statements are quite true, but as we have seen, this plant was already 1857 recorded from Disco by HOOKER under the name of *Peristylus albidus* (collected by LYALL).

Listera cordata, this was really found many years before on Disko by HOLBOELL, but the record of it was not published when HART wrote his paper.

Dryopteris Linnaeana was already found here in 1870 and recorded by BERGGREN in 1871.

Of other Disko plants in HART's list, the following deserve special mention:

Potentilla tridentata »common from Englishman's Bay to Point Lakse«. This statement is most surprising, as no other botanist has found it here, but H. G. SIMMONS has now informed us, (l. c. p. 470) that the plants thus determined by HART are really *Sibbaldia procumbens*.

Andromeda polifolia; the record of this very rare southern plant must also be due to some mistake (? *Loiseleuria procumbens*). According to SIMMONS (l. c. 472) no specimens are to be found amongst HART's collections.

Rumex Acetosella, is sometimes found at Godhavn but as an introduced weed.

Arctagrostis latifolia; according to my experience this statement is erroneous, as this high-arctic species has not been found by other collectors on the south coast of Disko, having its southern limit in the Nordfjord (see my list).

L. KUMLIEN, the naturalist to the Howgate Expedition of 1877—78, paid a visit of 3 weeks to south Disko: Godhavn and Disko-Fjord in

[1] H. G. SIMMONS has come to the same conclusion and he reports that no specimens of *Gn. sylvaticum* occur in the collections of HART in the British Museum or at Kew. (l. c. 472).

1879. The flowering plants were collected by him and determined by ASA GRAY, and a list of them is published in Bull. U. S. Nat. Mus. No. 15. Washington 1879. No special localities are given. Amongst the plants mentioned from Disko, the most interesting is *Arctostophylos alpina.*

JOH. LANGE published in 1880 the first part of his excellent »Conspectus florae Groenlandicae (Meddelelser om Grønland III) in which he has put together all records of Greenland plants known up to that time and chiefly based his results on his own revision of the large collections in the museum at Copenhagen. Here also are mentioned for the first time some small collections made by several Danish officials and ladies and sent to Copenhagen. For Disko the whole number of vascular plants recorded by LANGE amounts to about 175 species.

A. BERLIN and A. C. NATHORST, both participating in NORDENSKIÖLD'S expedition of 1883, collected plants on Disko. In his paper BERLIN enumerates about 44 species from the vicinity of Godhavn (Öfv. K. Vet. Ak. Förh. 1884 No. 7) whilst NATHORST records 21 species from the Vajgat coast. (Öfv. K. Vet. Ak. 1884 No. 1).

In both pamphlets several interesting varieties and forms are mentioned.

EUG. WARMING, visited during his journey to Greenland in 1884 the south coast of Disko and made, assisted by THEO. HOLM, rich collections here. Some of their most interesting gatherings are mentioned in a paper of WARMING'S in Meddelelser om Grønland VI 1886, (for the rest see the papers by HOLM and LANGE quoted below).

The main botanical results of the journey was the classical treatise of WARMING: Om Grønlands Vegetation (Medd. om Grønland XII 1887 with resumé in French ibid. (see also ENGLER'S Jahrbücher).

In this work are also given detailed accounts of some stations on Disko.

THEO. HOLM and L. KOLDERUP ROSENVINGE travelled in West Greenland in 1886 and also collected on the southcoast of Disko. HOLM published the results of his two journeys in ENGLER'S Jahrbücher VIII p. 283 ff., where some 121 species are mentioned from Disko, amongst them the very rare *Alchimilla alpina*, *Rhodiola rosea* and *Carex gynocrates* new to Disko.

The new localities found by ROSENVINGE, who was chiefly engaged in studies on Algae, are incorporated in the following paper. New to Disko are *Sedum villosum.*

In 1887 JOH. LANGE published a supplement to his »Conspectus« (Medd. om Grønland III, 2) in which several new localities are

mentioned, chiefly based upon collections made by Danish travellers and officials in Greenland, but partly compiled from papers of British and Swedish authors.

N. Hartz visited in 1890 a few localities on the Vajgat coast and in the neighbourhood of Mudderbugt and gave in 1894 (Medd. om Grønland XV) an account of the vegetation of those places. Of his most interesting gatherings *Potentilla Ranunculus*, *Pirola minor*, and *Callitriche verna*, were new to Disko, perhaps also *Stellaria borealis*. For the remainder of his gatherings see the following.

L. Kolderup Rosenvinge published in 1892 (Medd. om Grl. III cont.) a thoroughly revised list of the plants of Greenland, as a second supplement to Lange's Conspectus. Of Disko plants it contains most of Holm's and all Hartz' gatherings.

W. E. Meehan collected in 1892, during an expedition to Peary's winter-quarters, some plants near Godhavn, and published in 1893 a list of them, as well as of some plants collected by Dr. Burck in the same locality (Proc. Acad. Nat. Sci. Philadelphia 1893). Although in this list special localities are wanting, I suppose all the same that about 50—60 of his species may have been collected here.

Meehan records, without doubt erroneusly, the following interesting of his plants from Disko.

Potentilla tridentata; ? = *Sibbaldia* (see above Taylor and Hart.

Matricaria inodora as a garden weed; perhaps this is correct; only I may point out, that *M. Chamomilla* is quite common as a weed near the settlement.

$\left.\begin{array}{l}\textit{Pedicularis capitata}\\ \textit{Pedicularis versicolor}\end{array}\right\}$ *probably* = *P. flammea.*

It is evident to every one with any knowledge of the flora of Greenland and it is shown by different authors (for instance by Theo. Holm (ibid. 1895 p. 543 ff.), Meehan's paper is totally uncritical and unscientific, and no credit can be given to his statements, so long as they are not verified by others. Unfortunately Mr. Holm only saw part of his collections.

H. E. Wetherill collected, during the Peary Auxiliary Expedition of 1894 plants, partly near Godhavn, partly on the little-studied N. W. coast of Disko. A list was made by the staff of the botanical department of Harvard University (Bull. No. 5 of the Geogr. Club. of Philadelphia). From Disko 35 species are recorded, amongst which *Deschampsia alpina* is new to that island, and *Raphanus Raphanistrum*, a garden weed, is new to Greenland.

In 1896 L. KOLDERUP ROSENVINGE published a list of new records made since his paper of 1892. As far as Disko is concerned, some most interesting gatherings by the Rev. P. H. SØRENSEN, partly from Godhavn, partly from the Disko fjord are incorporated with it; also some collections made by M. TRAUSTEDT.

A remarkable number of the Rev. SØRENSEN's findings are made outside the ordinary area of distribution. All the determinations of these findings have been verified by ROSENVINGE, and the labels bear quite correct statements of finding-place, date, etc. But all the same I do think that some of them ought to be questioned, because, during several years, I have made an unavailing search for the plants in those localities within my reach, as for instance, *Cornus suecica*, a very conspicuous species which is recorded both from Egedesminde and Godhavn, even with ripe fruit. Besides, we meet with some quite improbable statements in the material collected by SØRENSEN. *Potamogeton gramineus*, for instance, being recorded from Røde Elv near Godhavn. But Røde Elv is a cold glacier torrent in which no *Potamogeton* is able to grow, least of all this purely temperate species, which otherwise is known from 60°—61° only, and occasionally up to 67°.

As the Rev. SØRENSEN lived during those years when he formed his collection, sometimes at Godthaab, about 64°, and sometimes at Disko-Bay I cannot get rid of the idea that his collections from the various places have somehow got mixed, which often happens, I am sorry to say, in the case of amateurs who fail to see the wide bearing of their statements. Therefore I cannot take these statements, into consideration, till they have been confirmed by more recent discoveries.

A. W. ROWLEE and K. M. WIEGAND published 1897 in (Botanical Gazette XXVI 2 p. 417—26) a list of plants collected by the CORNELL-Party of the PEARY expedition of 1896. From the vicinity of Godhavn 67 species are named, of which a few are rather rare, all however having been previously found here.

CHR. KRUUSE visited in 1897 during a botanical journey to West Greenland, the neighbourhood of Godhavn and gave in 1898 some accounts of the vegetation and of the plants noticed by him (Medd. om Grl. XIV p. 348 ff.).

MORTEN P. PORSILD visited Disko in 1898 and collected on the south coast, the Vajgat coast and some branches of the Disko-Fjord and in some valleys leading to the interior viz. the Kûgánguaq valley, the Kvan-valley behind Ujaragsugssuk. Of my collections, the *Potentillas* have been studied by P. A. RYDBERG (Bull. of the Torr. bot. Club 28,

1901). Of the vegetation I published an account in Medd. om Grl. XXV; for the remaining collections see below.

Herm. G. Simmons, botanist to the second Norwegian »Fram« Expedition in 1898, made an excursion to Lyngmarken near Godhavn. In a preliminary paper (Nyt Magazin for Naturvidenskaberne B. 41, 1903 p. 223) he mentions some of the plants noticed.

Theo. Holm published in 1900 a list of plants collected by the Peary Expedition of 1897 (Bull. of the Torr. bot. Cl. 27, p. 65—68); 2 species are mentioned from Godhavn.

Morten P. Porsild, during a summer trip to West Greenland in 1902, made a boat excursion round Disko and collected plants, not only on the coast round the island, but in all the fjords and on the western sides and at several stations in the interior of the northwestern part also.

Since my moving to Greenland in 1906 I have, partly alone, partly together with visitors to the Danish Arctic Station: H. Bachmann of Lucerne, M. Rikli of Zürich, W. Jost of Berne, Lauge Koch of Copenhagen, Th. Wulff of Stockholm, W. E. Ekblaw of Urbana, Ill. made numerous excursions on Disko, to the southern coast as well to the others, to the fjords and in the interior. On most of those excursions I was assisted by one or by both of my two sons: Thorbjörn and Erling Porsild, who besides collected on several trips for themselves. Also my former assistant Mr. J. N. Nygaard made several gatherings on the south coast.

I have found on Disko Island and, as far as I am aware for the first time:

Potamogeton Friesii (new to Greenland!), *Alopecurus aristulatus*, *Arctagrostis latifolia* (cfr. Taylor and Hart), *Deschampsia caespitosa* var. *pumila*, *Puccinellia tenella*, *Heleocharis acicularis* v. *submersa*, *Carex canescens*, *Ranunculus paucistamineus* v. *eradicatus*, *R. p.* var. *divaricatus* new to Greenland!), *R. reptans*, *Draba aurea*, *Saxifraga aizoides*, *Potentilla tridentata* (cfr. Taylor, Hart), *Callitriche autumnalis*, *Gentiana aurea*, *Plantago decipiens*, *Linnaea borealis*, *Antennaria intermedia*, *Hieracium groenlandicum* (together with Prof. M. Rikli).

J. N. Nygaard was the first to find:
Calamogrostis hyperborea.
Thorbjörn Porsild was the first to find:
Carex rufina, *Pirola minor* × *grandifolia* (new to Greenland!)

ERLING PORSILD was the first to find:
Botrychium lanceolatum.

This detailed enumeration shows clearly, that even from the best and most frequently investigated localities some new species could still be found and that consequently from lesser investigated areas the discovery of several species may still be expected.

The botanical investigation of the mainland of West Greenland between 71° and 66° has not been nearly so thorough as that of Disko Island but, nevertheless, better than on several other parts of the coast. My own excursions here extend from the Itivdleqfjord at 66°30′ N-Lat. to the Laksefjord at 72°30′, and they comprise especially:

1) The fjords in the Holsteinborg district, 1914.
2) Nordre Strømfjord, 1918.
3) The district of Egedesminde 1912, 1914, 1918.
4) The region about South East Bay 1917.
5) The land between the icefjords of Jakobshavn and Torssukátak 1915.
6) The south and west coasts of Nûgssuaq Peninsula 1902, 1908, 1909, 1911, 1913.
7) Hare Island 1909.
8) The coast and fjords between 71° and 72°30′ N-Lat., 1911.

THORBJÖRN PORSILD took part in the collecting work of No. 7 and 8 and on the journeys of 1911 and 1913 under No. 6, whilst ERLING PORSILD was my partner on the journeys No. 1, 2 and 3.

In the following is given an enumeration of the localities, where more or less extensive botanical collections have been made. For the names of the collectors I have used the following abbreviations. The mark ! behind a name denotes specimens seen by me.

Bg.	= Sv. Berggren.	Htz.	= N. Hartz.
Bl.	= A. Berlin.	Th. H.	= Theo. Holm.
R. Br.	= Rob. Brown.	Jens.	= J. A. D. Jensen (Bildsøe).
Engell	= M. C. Engell.	Jost.	= W. Jost.
Fr.	= Th. Fries.	Korn.	= A. Kornerup.
Hart.	= H. Ch. Hart.	Kr.	= Kruuse.

Nath.	= A. G. Nathorst.	Ros.	= L. Kolderup Rosenvinge.
Nord.	= A. E. Nordenskiöld.	R. & W.	= Rowlee and Wiegand.
A. P. O	= A. P. Olsen.	Syl.	= Sylow.
Pf.	= Pfaff.	Sør.	= P. H. Sørensen (Vibæk).
P.	= Morten P. Porsild.	T.	= Taylor.
E. P.	= A. Erling Porsild.	V.	= J. Vahl.
Th. P.	= Thorbjørn Porsild.	Vh.	= Vanhöffen.
P. & E.	= Erling & Morten P. Porsild.	W.	= Eug. Warming.
		W. & H.	= Warming and Holm.
Rink.	= H. Rink.		

H. H. = Herbarium Hauniensis, i. e.: the Arctic collections of the Botanical Museum at Copenhagen.

Hare Island. T. between 1856 and 1861; Nath. 1883; P. 1909.

Nûgssuaq Peninsula, Westcoast. Basalt and tufa.

Nûgssuaq Udsted 70°41′ V. 1836; Th. P. & P., 1911, P. 1913.
Big Valley from mouth along the north side of the river from Marrait to about 53°10′ W Long. P. 1902.
Marrait, Niaqornârssuk, 70°28′, P. 1902 & 1908.
Nûgssaq, Ivilik, Igdluluarssuit ab. 70°25′ V. 1836 P. 1902 & 1913.
Qingmerssorfik, Aussivik, Igpiârssuk ab. 70°23′ P. 1902 & 1913.
Niaqornârssuk 70°22′ P. 1909 & 1913.

Nûgssuaq Peninsula coast of Waygat. Carboniferous sandstone and shales interrupted by basaltic veins and by superimposed basaltic beds.

Alianaitsúnguaq, 70°21′ P. 1909.
Nûk, Nûk qiterdleq, 70°20′ P. 1909.
Atâ, Kugssinerssuaq, 70° 16—17′, Rink, Schuchert & White 1897, P. 1908, 1909 & 1913.
Pâtût 70°13′ Nath. 1883, Htz. 1890, P. 1909 & 13.
Manik 70°9′, Kingigtoq 70°8′, V. 1836, Htz. 1890, P. 1913.
Qardlúnguaq 70°4′, Htz. 1890.
Atanikerdluk 70°2′ R. Br. 1867, Nordensk. 1870; Th. Fr. 1871 Nath. 1883; Htz. 1890; Schuchert & White 1897; P. 1909 & 13.

Nûgssuaq Peninsula, south coast, gneissic district north of Torssukâtak Icefiord.

Naujat, Sarqaq 70°0′ V. 1835 & 36; R. Br. 1867; Bg. 1870; Th. Fr. 1871; Htz. 1890; P. 1913; E. P. 1913.
Qitingusait 70°8′ V. 1836.
Qeqertaq 70°0′ Bg. 1870; Sylow 1883; E. P. 1913.
Valley near Majorqarssuatsiaq 70°29′ Bg. 1870.

Land between Torssukátak and Jakobshavn Icefjords.

Ulússat 69°52′ Sylow 1883.
Igdlutalik, Qeqertakavsaq 69°53′ P. 1915.
Arsivik, Igdluluarssuit 60°50′ P. 1915.
Eqe 69°44′ P. 1913 & 15; Jost 1912 & 13.
Atâ 69°43′ Th. P. 1913; P. 1915.
Ritenbenk, Kangeq 69°43′ V. 1836; R. Br. 1867; Bg. 1870; Sylow 1883; Htz. 1890; Kr. 1897.
Klokkerhuk 69°32′ V. 1835.
Pâkitsoq, Ilordleq, Berggrens Havn 69°28′ V. 1833 & 35 & 36; R. Br. 1867; Bg. 1870; Sylow 1883; P. 1915.
Rode Bay 69°20′ V. 1836; R. Br. 1867; Sør.
Brede Bugt 69°17′ P. 1915.
Jakobshavn, Sermermiut 69°13′ V. 1833 & 35; R. Br. 1867; Bg. 1870; W. & H. 1884; Sør.; P. 1915—18. A. P. O.
Imilik 69°11′ Sør. Th. P. 1918.
Navdluarssuk 69°13′ W. & H. 1884.

From Jakobshavns Icefjord to Sydostbugt.

Claushavn, Sandbugt, Tasiussaq, Nunatap tasia, ca. 69°5′ V. 1835; R. Br. 1867; Bg. 1870; Engell 1902.
Lerbugt 69°0′ Bg. 1870; Htz. 1890.
Christianshaab, Kangersuneq 68°48′ V. 1835; R. Br. 1867; Bg. 1870; Sylow 1883; W. & H. 1884; Htz. 1890; P. 1917.
Niaqornaq, Niaqornârssuk 68°43′ V. 1835.
Islets in the Sydostbugt, Akugdlît, ca. 68°40′ Bg. 1870; Htz. 1890; P. 1917.
Ikamiut 68°38′ Bl. 1883; Kr. 1897.
Orpigssuit, 68°36′ V. 1835; Htz. 1890; Engell 1902.
Sarpiussat, south coast of Sydostbugt, ab. 68°32′ Bg. 1870; P. 1917.

Archipelago of Egedesminde.

Kronprinsens Ejland 69°0′ V. 1883; Kr. 1897.
Hunde Ejland 68°52′ Sør. Kr. 1897; P. several times.
Kullen, Manîtsoq, Isuamiut ab. 68°45′ Bl. 1883; Kr. 1897; P. 1918.
Egedesminde and environs, Akúnâq, Tuluvartalik, ab. 68°43′ E. P. 1918 north side of Sarqardlît island V. 1883; R. Br. 1867; Bl. 1883; W. & H. 1884; Htz. 1890; Sør.; P. several times.
Manermiut, south side of Sarqardlît island, Nivâq ab. 68°35′ Bg. 1870; Kr. 1890; P. & E. 1918.
Islands in the Bay of Nivâq, northern part, 68°30′—35′ Kr. 1897; P. & E. 1818.

Islands in the Bay of Nivâq, southern part, 68°25′—30′ Kr. 1897; P. & E. 1918.

Kangâtsiaq and environs 68°18′ Bg. 1870; Bl. 1883; Kr. 1897.

Simiutarssuaq and other islands in the mouth of Arfersiorfik 68°10′.

Alángorssuaq and Tugtulik in the mouth of Ataneq fjord 68°5′ Kr. 1897.

Agto and other islands hereabout ca. 67°58′ Kr. 1897; P. & E. 1914 & 18.

Kangeq, s. of Agto 67°48′ E. P. 1918.

Interior of Egedesminde District.

Northwest coast of Naternaq 68°25′, fjord s. of Nãngissat 68°30′ P. & E. 1918.

Isthmus to Tasiussarssuaq ca. 68°32′. Bg. 1870; Bl. 1883; P. 1917.

Tasiussarssuaq, Sofias harbour ca. 68°25′. Bg. 1870; Bl. 1883.

Aulatsivik and environs ca. 68°10′ Bg. 1870; Kr. 1897.

Ataneq Fj. ca. 68°0′ P. & E. 1914.

Kangerdluarssuk, east of Agto 67°59′ E. P. 1918.

Northern Strømfjord.

Taseralik, 67°26′ P. & E. 1918.

Eqaluarssuit, 67°36′, P. & E. and north coast opposite P. & E. 1918.

Tiggaq, 67°38′, Sør.

Ipiutarssuaq, 67°43′, Korn. 1879; P. & E. 1918.

Southern branch ab. 67°30′, Jens. & Korn. 1879.

Branch from Ipiutarssuaq — to the rapids of Sarfarssuaq 67°43′—48′ Korn. 1879; P. & E. 1918.

Ugssuit, 67°46′—50′ P. & E. 1918.

Qarsorsaq, 67°53′ P. & E. 1918.

Nuerssorfît ab. 67°55′ P. & E. 1918.

Land between Northern Strømfjord and Holsteinborg.

Tatsip atâ 67°20′ W. & H. 1884; Htz. 1890.

Kôrorssuaq in N. Isortoq 67°15′ V. 1832, Ros. 1886.

Kangârssuk, 67°3′ V. 1832.

N. Kangerdluarssuk 67°4′ Ros. 1886.

S. Kangerdluarssuk ca. 67°0′ W. & H. 1884; Ros. 1886.

Land between 66°—67°, Holsteinborg and fjords.

Holsteinborg, Præstefjæld, Kællingehætten, 66°55′ V. 1832—33; Korn. 1879; W. & H. 1884; Ros. 1886; Htz. 1889 & 90; P. & E. 1914.

Kerrortussoq, 66°55′ W. & H. 1884.
Sarfánguaq, 66°53′ W. & H. 1884; E. P. 1914.
Maligiaq, 66°56′ W. & H. 1884; P. & E. 1914.
Itivneq-valley 66°57′—67°2′, V. 1832; W. & H. 1884; P. & E. 1914.
Ikertôq fjord 66°47′, V.
Naujarssuit, fjord of Qeqertalik 66°45′, Brummerstedt, P. & E. 1914.
Head of Itivdleq-Fjord of 66°30′, P. &E. 1914.
Itivdlínguaq 66°29′ Jens. 1884; P. & E. 1914.
Head of S. Strømfjord, Nakajanga, Umîvik and environs ca. 66°50′ Jens. 1884.

The above mentioned list shows that the botanically examined localities are situated rather close to the outer coast, while the interior of the large ice-free territory from 66°5′ up to the Disco Bay still is quite insufficiently investigated. The numerous discoveries of rare plants, often far from their ordinary area of distribution, which have especially been made in the southern part of the country, show that large results may still be looked forward to here. And as this territory in geographical-geological respect, too, may probably be reckoned among the most interesting in Greenland, both a closer investigation and a better and more detailed charting would seem to be one of the most remunerative tasks of the future. May they come soon!

Remarks to the following catalogue of plants.

Determination of the material.

I determined the results of my first journey at Copenhagen where I had free access to the Arctic Herbarium in the Botanical Museum. Besides, great assistance was given me by Prof. Dr. C. H. OSTENFELD, the then inspector of the Museum. After my departure for Greenland numerous critical questions have been sent Dr. OSTENFELD for decision. Some plants have been determined by Prof. C. RAUNKIÆR, Copenhagen (*Potamogeton mucronatus*), Dr. H. DAHLSTEDT, Stockholm (*Taraxacum*, *Hieracium*), and Dr. P. A. RYDBERG, New York (*Potentilla*). My warmest thanks are due to these men, whose names I have mentioned, for the help given to me. Where in the following list the determination is due solely to their judgement, this is expressly mentioned, where nothing is stated, the responsibility of the determination rests on me.

Nomenclature. As I have but a limited access to literature here, especially to the older one, and none at all to any larger collections, I am absolutely debarred from having any independent opinion as to the question of nomenclature. I have therefore largely made use of the nomenclature of the following works:

1) C. H. Ostenfeld: Flora arctica I. 1902 (NB! published before the Vienna Rules of 1905).
2) Diverse works by H. G. Simmons especially: The Vascular Plants in the Flora of Ellesmereland 1906. Flowerimg Plants and Ferns of North Western Greenland, 1909, and Survey of the Plytogeography of the Arctic American Archipelage 1913.
3) B. L. Robinson and M. L. Fernald: Handbook of Flowering Plants and Ferns. (Gray's new Manual 7th edition 1908).
4) C. A. M. Lindman: Svensk Fanerogamflora Stockholm 1918.

The distribution of the plants: This section is written by Erling Porsild, revised and finally prepared for publication by M. P. Porsild. Besides literature, our own collections and our excursion diaries have been resorted to, which especially contain information about the occurrence of the species common to the region concerned. As to rarer species we have mentioned the name of the finder, but in those cases when the species is fairly common we have omitted this and replaced it by our general indications of frequency. Our special aim has been to state, with greater accuracy than that used in Lange's Conspectus Fl. Grl., the character of the natural habitats of the plants. We have especially proceeded on the lines laid down by L. Kolderup Rosenvinge in „Andet Tillæg" and by N. Hartz in „Fanerogamer og Karkryptogamer fra Nordøstgrønland".

The vertical distribution we have tried to express in general remarks, having dispensed with statements of the actual numbers in hand. In fact they seem to us still far too few and casual and hardly entitled to be published. Generally we think that a true arctic plant, what we in the following call a northern or widely distributed type, has no limit of elevation upwards, but on the other hand, it frequently has a limit of elevation downwards near the southern limit of its horizontal distribution, which, of course, does not prevent it from occurring occasionally below its continuous distribution, especially in places where fresh moraine advances far down in the lowland, or where rivers and mountain streams may carry it right down to the coast. The absence of certain arctic species in the lowland are hardly due to climatic conditions, the cause being the competition between the species.

Far otherwise the plants which we denote as southern types.

They are almost without any exception lowland plants at the northern limit of their horizontal distribution.

Our use of the expression lowland is relative, somewhat varying according to the locality. On the north side of big massives we denote as lowland a level as low as a couple of hundred meters above sea-level, on the south side and in protected places in the interior up to 400—500, occasionally even up to 600—700 meters above sea-level. The decisive proof to us has been whether the place had old concentrated vegetation or fresh moraine soil with open vegetation.

Generally we have not stated the exact dates of flowering of the plants. After having kept, through a longer period of years, a journal of the earliest flowers from a single place and its vicinity we have arrived at the conclusion that a certain succession in the time of flowering can be proved for a majority of the arctic species, but that the actual dates may vary at least 6 weeks, namely just as much or more than the date varies at which the positive mean temperature begins. A few pronounced arctic species have no definite flowering season at all, they flower continuously throughout the period of vegetation.

As a general fact may be stated that the true arctic species (northern and widely distributed types) flower early, the subarctic or temperate late, provided that they attain to put forth flowers at all. When two systematically closely allied species belong each to its own type a characteristic difference, as to their flowering season, may be found, this fact being supported by numerous examples:

Early flowering.	Late flowering.
Deschampsia caespitosa var. *pumila*	*D. alpina.*
Luzula confusa, *L. nivalis.*	*L. frigida*, *L. spicata.*
Stellaria longipes, *St. humifusa.*	*St. borealis.*
Potentilla Vahliana, *P. nivea.*	*P. alpestris.*
Chamaenerium latifolium.	*Ch. angustifolium.*
Pirola grandiflora.	*P. minor*, *P. secunda.*
Pedicularis lanata, *P. hirsuta.*	other species of *P.*, the latest flowering is *P. euphrasioides.*
Erigeron eriocephalus.	*E. unalaschkensis.*
Antennaria alpina.	*A. intermedia.*
	etc.

At another occasion we hope to come back to this subject, meanwhile confining our attention here to statements of early and late flowering in such cases where this seemed especially characteristic to us, just as we everywhere have stated absence of flowering as far as this was known to us.

Likewise we have everywhere mentioned if the plant fruits, and our observations are in this case based, not only upon observations and gatherings of seeds and fruits in nature, but also in most cases upon seedlings which we have either collected or observed in nature or cultivated from gathered seeds. Also this material will be treated of in another place. We have especially tried to give minute information in regard to these cases in which fruiting occasionally took place or was always wanting.

Finally we have stated — mainly proceeding along the lines laid down by Hartz (l. c.) — our observations concerning the hibernation of the plants whether it took place under cover of snow, cover of ice or snowless. But we have hereby only considered the living parts of the plants, buds, live leaves and stalks, and not the withered fruiting inflorescences.

It is only occasionally that we have stated the occurrence of plants with withered inflorescence over the snow (»winterstanders«, Sernander), partly because we think, that a plant with empty or unripe fruits whose seeds consequently have lost their power of germination, ought not to be classed here, and partly because our observations on this point are not yet complete.

Naturally we have made our experiences from the vicinity of our home in South-Disco the basis of these biological observations. As to species occurring only in more remote regions, which we have but been able to see during winter, we have, as far as possible, tried to judge of the cover of snow there, which is deducible from the local conditions predominant in the place: chiefly the aspect of the rest of the vegetation and, to a great extent, the occurrence of lichens on boulders and stones. In this connection we have again drawn upon our experiences from numerous sledge-travels and excursions during winter, not only on Disco, but also far to the south and north of it. Besides travels along the coasts we have made numerous trips into the inner highland of Disco, through the peninsula of Nûgssuaq and the Ataneq-fiord, Nordre Strømfjord, Isortoq fjord to Holsteinborg.

Numeration.

In the list we have incorporated with numbers all indigenous species and such varieties or races which had a distribution deviating from the main species.

Without number we have incorporated such species that are mentioned in literature, but whose occurrence in the locality we doubt; furthermore acclimatized introduced species. On the other hand we have not at all incorporated the numerous weeds which now and then appear near the settlements, leading but an ephemeral existence.

Type-denomination and -symbols.

At almost every species we have stated to which type of distribution it belongs. In this we have mainly considered West Greenland in its entirety, and then the rest of Greenland, America or Europe.

Besides we have tried to fix the type-determination in a symbol which through its form might direct the thought to what it ought to express, and yet be produced in ordinary typographical get-up. Thus signifies:

T a species whose main distribution is in the high arctic territory and which only, as an isolated exception, occurs to the south of this.

V a northern type whose distribution extends from the high arctic territory more or less far down into W. Greenland where it gradually becomes scarcer or at last occurs but as alpine.

! an arctic type widely distributed in W. Greenland yet decreasing, alpine or quite absent in the very southernmost part.

I a widely distributed species without northern- or southern limits in W. Greenland.

¦ widely distributed species which yet, as far as hitherto known, become scarcer or are quite absent as well in the northernmost as in the southernmost W. Greenland.

i widely distributed species without southern limit, but which yet in the northern tracts become very scarce, confining themselves to specially favourable sites or being quite absent.

Λ southern types, subarctic species without southern limit, but with more or less sharply marked northern limits in W. Greenland; in our area all of them lowland plants.

⊥ non-arctic types whose main distribution in other countries is in the temperate regions; in our area they are rare and without continuity in their distribution. A great number of aquatic plants are classed among them.

Finally we have incorporated with number two plants that hitherto have been found only in South Disco. They are not sufficiently known

being probably either hybrids or chance mutations, endemic species in an embryo state.

They are indicated thus: •

The distribution in the adjacent parts to the south of the area is briefly subjoined, quoted almost exclusively from L. Kolderup Rosenvinge's carefully revised "Andet Tillæg etc.". As to the distribution to the north of the area we have made use of Abromeit's revision of Vanhöffer's collections, but especially of our own observations published in "Vascular Plants 71°—73°".

Cryptogamae vasculares.

I. Polypodiaceae.

⊥ 1. **Dryopteris Linnæana** C. Chr. (*Aspidium Dr.* (L.) Baumg.

In herb-mats and copses, often in the shade under rocks, but always in favourably situated, sheltered places; especially near the hot springs.

Disko: The south-coast from Laksebugt to Skansen, from many places (several collectors). Disko-Fjord: the north-coast, rarer; the northmost at Kuánersôq 69°32′ (P.).

Mainland: N. Isortoq 67°10′ (Ros.), Præstefjæld at Holsteinborg (W. & H.), (P. & E.).

A decided southern type; in vain searched for in a great many favourably situated places in the fjords south of Disko-Bay. South of the here mentioned place from 65°64′ and (according to Rosenvinge) common south of 63°.

All the mentioned places in the lowland. Usually *sori* are found, but sporangia only seen on specimens from Kuánersôk.

During the winter under a thick cover of snow.

V 2. **Dryopteris fragrans** (L.) Schott.

On sheltered, sunny, not too dry rock-shelves; more scarce on stony soil in the heath.

Disko: Very rare, hitherto only from the vicinity of Godhavn (V.) and basalt-rocks behind Evqitsoq in Diskofjord 69°32′ (P.).

Mainland: Rather common in the gneissic tracts, especially at some distance from the outer coast; from 70° at least to 67°. Still, in the fjords inland from Holsteinborg, rather common. The southmost locality hitherto known at ca. 64°44′.

In Greenland a decided northern type; in U. S. A., however, to be found down to New England and Minnesota.

Ascending at least to 700 m.

To be sure often snowless during winter, the living shoots being protected by the withered old leaves.

Abundantly fruiting.

⊥ 3. **Dryopteris dilatata** (HOFFM.) A. GRAY.

In sheltered and humid herb-mats, very rare in our area.

Disko: Recorded from Godhavn, 69°14′ (Sør.) but afterwards vainly searched for on every suitable spot here.

Mainland: Portusût Island N. of Kangatsiaq, 68°27′ (Kr.!), Itivneq, 66°58′ (W. & H.).

A decided southern type, not common till south of 62°.

Covered by thick layers of snow in winter. The specimens from Portusût were fruiting.

⊥ 4. **Polystichum Lonchitis** (L.) ROTH.

In sunny and most herb-mats, on rock-ledges and in bushland.

Disko: Mellemfjord: Kuánit 69°44′ (P.). The south coast of Disko at Godhavn especially Engelskmandens Havn, several collectors. Blæsedal (Th. H.).

A decided southern type. On the main land found south of 65°25′ only.

Abundantly fruiting. Hibernates under a thick cover of snow.

I 5. **Cystopteris fragilis** (L.) BERNH.

On sunny, not too dry rock-ledges, in fissures, herb-mats, and thickets, but not at all everywhere; yet found in numerous favourably exposed localities, throughout the whole area.

Chiefly in the lowland, but also higher up now and then. Widely distributed species without northern or southern limit in Greenland.

Occurs in several forms according to the quality of the habitat.

Abundantly fruiting.

Rhizome and buds always covered by snow.

I 6. **Woodsia ilvensis** (L.) R. BR. and **var. alpina** BOLTON ASCH. & GRAEBN.

On rocks and often on gravel and similar barren places. Very common throughout the whole area, but rarer on basalt than on gneiss. Most frequently the variety occurs, the main-species being limited to the most favourable conditions and is likely not to be found in the northern part of the area.

The species widely distributed, with northern limit in Greenland, but the precise limit cannot yet be settled, undoubtedly occurring north of 74°.

Ascending the hills certainly to the snow-line.

Abundantly fruiting.

Rhizomes and buds covered by the withered leaves which are loosened by the pressure of the snow-cover, being squeezed together in a lump that contributes to protect the rhizome and the buds till the snow melts or drifts away.

Certainly snowbare now and then.

V 7. **Woodsia glabella** R. Br.

On warm, moist rock-ledges often near waterfalls, rarer on gravelly soil. Rare, only occurring in small associations and often as isolated specimens only.

No doubt often overlooked.

Disko: Near Godhavn. On rocks near a spring in Østerdal (Th. P.) Blæsedal near Røde Elv on basalt gravel (Ekblaw).

Diskofjord: The basalt-rock at Evqitsoq (P.), Kuánerssuit (P.).

Mainland: Eqe 69°45′ (P.), Igdluluarssuit 69°50′ (P.), Christianshaab (V., Th. H.), Tasiussarssuaq (Bg.), Sofiehavn (Bl.), the mainland south of Nivâq Fjord 68°30′ (P. & E.), Kangerdluarssuk E. of Agto 67°59′ (E. P.), N. Isortoq 67°15′ (V.), Ikertôq (V.).

Just as *Dryopteris fragrans* this species, too, is a northern type in Greenland, although it is found far southwards in U. S. A.

Hence in W. Greenland the southern limit is at the last mentioned locality.

On the other hand it has been found in E. Greenland down to 61°30′.

All the above-mentioned localities are in the lowland, but southwards it is likely to be found at considerable altitudes.

Abundantly fruiting.

No doubt always covered by snow in winter or enclosed in ice.

II. Ophioglossaceae.

⊥ 8. **Botrychium Lunaria** (L.) Sw.

On warm and somewhat moist slopes, in herb-mats often in shade under other vegetation.

Disko: Environs of Godhavn 69°15′; from Engelskmandens Havn to Kuánit gathered at several places by various collectors.

A decided southern type, on the mainland hitherto only found to 65°10′ and not common till S. of 62° (Ros.). Lowland plant.

Fructificates in favourable places.

Covered by thick layers of snow in winter.

⊥ 9. **Botrychium lanceolatum** (GMEL.) ÅNGSTR.

Disko: Engelskmandens Havn, only found once and in a single specimen (E. P.), afterwards often searched for in vain.

A decided southern type, in Westgreenland only known from several places between 60° and 61°30′ and single specimens from 63° and 64°25′.

Our specimen was abundantly fructificating (Aug. 1911).

III. Equisetaceae.

i 10. **Equisetum variegatum** SCHLEICH.

In bogs, swamps and heath among mosses and other vegetation, often in water some part of the year; frequently forming pure associations, especially on periodically inundated sand. Thus at the river-mouths in the sandstone-districts.

Common throughout the whole range.

A widely distributed species, the northern limit of which must be N. of 72°30′, but is not yet known.

At Disko-Bay ascending the hills to 800 m.

Mostly sterile; fructificating specimens found especially in favourable places.

During winter covered by snow, often also by ice.

⊥ 11. **Equisetum scirpoides** MICHX.

In luxuriant not too moist herb-mats and bush-land, often in shade.

Disko: Very rare, only found a few times in the neighbourhood of Godhavn 69°15′ (Br.; Bg.; Th. H.; Kr.) and now most likely extinguished because of the cutting down of the willows for fuel.

Diskofjord: Kuánerssuit (69°33′ P.).

Mainland: Tasiussaq S. of Egedesminde, 68°40′ (W. & H.),[1] Kangerdluarssuk S. of Agto 67°59′ (E. P.), in Nordre Strømfjord (P. & E.), at several places and rather common in the fjords inland from Holsteinborg (P. & E.).

A decided southern type; among the above mentioned localities the north-limit is to be found.[1] S. of Holsteinborg it seems to become rarer or perhaps overlooked.

[1] In herb. JOH. LANGE I have seen a specimen labelled "Tasiussaq $^{29}/_{7}$ 1887. Ryder." If correct that would mean the place at 73°22′, but I think the record must be due to some confusion.

All the mentioned localities are in the lowland.
Mostly abundantly fruiting.
Hibernates covered by thick layers of snow.

⊥ 12. **Equisetum silvaticum** L.

A decided *southern type*, from 65° and southwards rather common. N. of this latitude it is recorded from Aulatsivikfjord 68°0′ (Bg.); an islet in the Sydostbugt (Bg.); Imilik at the icefjord of Jakobshavn 69°10′ (Sør.) and Disko at Godhavn (Walker). In all these places it has been repeatedly sought in vain for by us, and it has never been found, neither by the above mentioned collectors nor by us, at the heads of the big fjords at Holsteinborg and north of it. The northmost specimens in H. H. are from South Isortoq (65°20′) and vicinity of Godthaab.

I 13. **Equisetum arvense** L.

In bogs, swamps, and heath; often inundated a great part of the summer when growing on lakeshores. Also as undergrowth in rich herb-mats and thickets. Often it forms extensive growths along the shores of rivulets and lakes or in thickets.

Very common throughout the whole area.

Wide-spread species, probably without northern limit in Greenland. Ascends undoubtedly to the snowline. Abundantly fruiting except in the most humid places.

Covered by snow and often by ice in winter.

Varies very much in luxuriant places; in the southern part of the land, especially in herb-mats and thickets, forms occur with spikes on the branching green shoots.

IV. Lycopodiaceae.

I 14. **Lycopodium Selago** L.

In swampy heath and bogs, in herb-mats and willow-thickets especially on organogenous soil, not on petrogenous. Very common throughout the *whole range*. Wide-spread species, probably without northern limit on the coast of Greenland. Ascends the hills as far as the preceding vegetation has deposited sufficient mould, and is thus not among the pioneers of plants.

Varies according to the quality of the habitat; most common is *f. appressa* Desv. the very branchy, yellow-green form with densely appressed leaves. Hardly ever fruiting, but forming bulblets in abundance with great power of migration and germination. In vigorous heath, herb-mats and copses less ramified forms occur with distant leaves, in appearance and size quite similar to the main-species from the temperate

regions. The main form is often fructificating, it never forms bulblets or exceptionally a few at the top of the shoots. This latter form we have not seen north of South-Disko.

Covered by snow during the winter.

Λ 15. **Lycopodium annotinum** L.

In thickets and luxuriant heath.

Disko: Not uncommon on the south-coast, in the big valleys and the two southmost fjords. Not noted elsewhere on the island.

Mainland: Rather common in the gneiss-land, especially at some distance from the coast growing more and more common southwards. Not noted in the basalt- and sandstone-range and rare in the outer part of the archipelago of Egedesminde.

Common is var. *pungens* Desv. In thickets the mainspecies is rare, but there are numerous transitorial forms between them.

The species must be considered a southern type, rather widespread in Greenland, but getting more scarce northwards and here the north-limit is provisionally to be settled at 72°48′.

Usually a lowland plant, not ascending to any considerable altitude.

As a rule abundantly fruiting.

Covered by snow during winter.

⊥ 16. **Lycopodium complanatum** var. **Chamaecyparissus** A. BR. (*L. tristachyum* PURSH).

A pronounced southern type recorded from Disko at Godhavn 69°15′ (Sør.); in vain scarched for by us for several years; besides found at Skansen 69°25′ (Rikli).

From the mainland known from a few places, the northmost of which at ca. 65°.

Λ 17. **Lycopodium alpinum** L.

In favourably exposed heath and dry herb-mats.

Disko: Numerous localities along the southcoast (many collectors); Eqaluit 69°40′ (P.); Mellemfjord Sarqardlît ilordlît 69°40′ (P.).

Mainland: At the trading-place Nûgssuaq 70°40′ (V.); Majorqarssuatsiaq 70°12′ (Bg.); Jakobshavn (W. & H.); Egedesminde (W. & H.); Kangerdluarssuk S. of Agto 67°59′ (E. P.); Eqaluarssuit in Nordre Strømfjord 67°36′ (P. & E.); N. Isortoq 67°10′ (Ros.).

Recorded by many collectors and from numerous localities in the broad land, between 66° and 67°.

A southern type with north limit at the northmost of the mentioned habitats.

Lowland plant. Often sterile, although fruiting specimens occur now and then.

Covered by snow in winter.

V. Isoëtaceae.

⊥ 18. **Isoëtes echinospora** Dur.

A pronounced southern type found at Tasiussarssuaq, Sofiehavn 68°25′ (Bl.), otherwise not known till between 60° and 61°.

The specimens were sterile.

Gymnospermae.

VI. Pinaceae.

Λ 19. **Juniperus communis** L. var. **montana** Ait.

On warm sunny rock-slopes.

A southern type known from several localities in the fjords inland from Holsteinsborg, but by no means common. In the interior of N. Strømfjord rare f. inst. Eqaluarssuit 67°36′ (P. & E.); Ipiutarssuaq 67°44′ (P. & E.); Sarfarssuaq 67°50′ (Korn.); Ugssuit 67°58′ (P. & E.); at Tasiusarssuaq 68°28′ (Bl.); Orpigssuit 68°35′ (Engell).

Finally, according to verbal communication from Mr. P. Dalager, it is said to occur at the head of Kangersuneqfjord 68°50′ and thus we have the north-limit here.

All above mentioned localities are in the lowland.

Most of the observed specimens were abundantly fruiting. — No doubt covered by snow in winter, but early snowless in spring.

Monocytyledones.

VII. Sparganiaceae.

⊥ 20. **Sparganium submuticum** (Hartm.) Neum.

Waterplant.

A decided southern type collected only in the following places: Naujat 70°0′ (Htz.); Orpigssuit 68°37′ (Htz.); Tasiussarssuaq 68°28′ (Bg. refound by Bl.); Nivâq Bugt, several places (P. & E.). Aulatsivik settlement 68°10′ (Kr.). Otherwise not observed till south of 64°, but likely often overlooked.

Some of the above mentioned findings were fruiting.

Hibernates under or enclosed in ice.

VIII. Potamogetonaceae.

Flowering, fructification and wintering.

All the species of this family, as well as the rest of the Greenlandic true waterplants, occur in shallow water especially in ponds that freeze

to the bottom during the winter. The length of their vegetative period especially depends upon the condition of the spring and the autumn. In case of a cold spring the ice along the pondshores is rather long in melting, and if the autumn sets in early, the ponds are quickly freezing up again. During such unfortunate summers the Potamogetonaceae (and other waterplants) hardly attain to flowering and not at all to fructification, they reproduce by continuous forming of winterbuds. In more fortunate seasons the period of vegetation in the same water will last long enough for the forming of flowers and fruits. But this is, in our area, an exception, all the following species being decided southern types with their north limit here.

As the climatic conditions in the arctic lands vary from year to year, and as the amount of warmth necessary to the vital functions of the plants is not only relatively, but also absolutely inconsiderable, it is no wonder that the same species on the same latitude is sometimes found flowering, sometimes quite sterile.

⊥ 21. **Potamogeton alpinus** Balb.

Itivneq at Holsteinborg 66°58′ (W. & H.), only once collected here; the north limit of the species.

Known from Godthaabfjord and some places in the extreme South Greenland.

⊥ 22. **Potamogeton gramineus** L.

In a small lake near the river to the head of S. Strømfjord ca. 67° (Jens.) only once found here. The north limit of the species.

Elsewhere only known from the southmost part of Greenland 60°—61°.

Note: The species is also recorded from Røde Elv at Godhavn 69°15′ by Rev. Sørensen. The specimens were determined, and of course correctly, by Prof. L. K. Rosenvinge, but from where it originates. we cannot say. It can not be from Røde Elv, this being a cold clacier-torrent in which no phanerogamous waterplant is able to thrive, least of all a *Potamogeton* with a southerly distribution as *P. gramineus*.

⊥ 23. **Potamogeton mucronatus** Schrad. (*P. Friesii* Rupr.).

Diskofjord in small ponds at Eqalúnguit Itivnere 69°32′ (P.) det. Prof. C. Raunkiær. Afterwards not seen in Greenland.

The specimen was sterile.

⊥ 24. **Potamogeton obtusifolius** M. & K.

The district of Egedesminde: Ikamiut inlet in Nivâq Bugt 68°40′ (Kr.).

The specimens were sterile.

∧ 25. **Potamogeton pusillus** an L.? (**P. groenlandicus** Hagstr.)

Collected several times in the vicinity of Diskobugt; perhaps more careful observation will prove the plant to be of not infrequent occurrence.

Disko: A pond at the blubber-yard at Godhavn 69°15′ (P.).

Mainland: Sarqaq 70°0′ (Htz.), the north-limit of the species, Ritenbenk 69°45′ (S. H.); Jakobshavn 69°13′ (Sør.); Claushavn 69°5′ (Bg.); Christianshaab Orpigssuit (Htz.) 68°37′; Egedesminde (Bl.); Sofiahavn 68°25′ (Bl.).

For the rest only known from a few localities in the southernmost part of Greenland, most likely overlooked.

∧ 26. **Potamogeton filiformis** Pers. (*P. marinus* L. p. p.).

This species has been found a few times in the fjords inland from Holsteinborg 66°58′ (W. & H.), and here later on found to be commonly extended in all smaller ponds (P. & E.); at the head of S. Strømfjord about 67° (Jens.); Itivdlínguaq 66°29′ (P. & E.). Southwards it is known from Godthaabfjord and from several localities in the southmost part of Greenland, being no doubt common here.

The next domain is in the vicinity of the Sydost-Bugt: Manîtsoq at Egedesminde 69°45′ (Bl.); Tasiussarssuaq and the passage to this place about 68°30′ (Bg. and others); at the head of Orpigsôq 68°40′ (Htz.); Christianshaab 68°45′ (V.).

Further it has been found isolated at Narssaq on Disko 69°52′ (Th. Fr.); Nûgssuaq Peninsula: Atanikerdluk 70°5′ (Htz.) and Ikerasak 70°30′ (Vh.), the northern limit of the species.

In some of the mentioned localities the species were flowering.

IX. Juncaginaceae.

∧ 27. **Triglochin palustre** L.

On strand-meadows, on lake-shores in marshes and periodically inundicated riverbeds.

Undoubtedly often overlooked.

Disko: From localities on the southern coast and Diskofjord (P.); Nordfjord: in the big valley from the head of the fjord about 70° (P.).

Mainland: From Jakobshavn down to the fjord-complex inland from Holsteinborg found so often as to be considered common. N. of Jakobshavn found now and then along the coast of Waygat up to Atâ 70°15′ (P. and others); in the Nordost-Bugt at Ikerasak 70°30′ (Vh.) and Ũmánaq 70°43′ (Vh.) the northern limit of the species.

A decided southern type, in the district not ascending to any height worth mentioning.

Flowers and fructificates abundantly, but not every year.

Hibernates abundantly covered by snow and sometimes also by ice.

X. Gramineae.

I 28. **Hierochloë alpina** (LILJEBL.) R. & S.

On mouldy and peaty soil, on rocky flats and especially in dry heath, rarer in thickets and herb-mats.

Stands manuring very well, but does not occur in aggregate patches.

Very common throughout the whole area.

Wide-spread arctic plant with neither northern nor southern limit.

Ascends the hills to the snow-line, but only in old vegetation, not belonging itself to the pioneers of the new moraines.

Abundantly flowering and fruiting.

Probably often snowless during winter. The live buds densely covered by the withered leaf-sheaths.

A 29. **Phleum alpinum** L.

In vigorous herb-mats and thickets.

Disko: South-coast at Godhavn 69°15′ numerous localities (P. and others); inside the Blæsedalen about 69°20′ (Nygaard); Diskofjord (69°30′ (P.) rare. All the localities in neighbourhood of hot springs.

Mainland: N. Isortoq 67°10′ (Ros.); Præstefjæld at Holsteinborg 66°55′ (P. & E.). Thereafter at 65° and 64° and common south of 64° (Ros.).

A decided southern type, the above mentioned localities being the north limit in Westgreenland.

All the mentioned localities are in the lowland, but in the southmost part of Greenland it is observed to a height of 500 m (Ros.). Flowers yearly, but only as an exception does it fruit in the most favourable localities. The grains are however not spread, remaining in the spike under the snow, but through experiments I have ascertained their growing power (E. P.).

Hibernates abundantly covered by snow.

V 30. **Alopecurus alpinus** SM.

The natural habitats of the plant are moss-bogs and moist spots in the heath; but owing to its great predilection for organical manure and great power of dispersal it appears at all the present and former settlements, tent places, underneath fowling cliffs, on fowling islets and near fox's dens in friable soil. In these manured places the plant becomes much more vigorous than in the bogs and forms extensive patches that characterize the settlements more than any other plant. When the supply of manure is stopped, an abatement in its luxuriant growth sets in; hence we can, to a certain extent, draw a conclusion, as to the age of the old settlements, from the rate of its development.

Sometimes it occurs in places that are inundated in the spring and early summer. In these places it develops long floating leaves and resembles the following species.

During wet summers, when the pools do not dry up, it does not flower, thus differing from the following one.

Because of its vegetative luxuriance in manured places it is particularly adapted to fodder for sheep and goats, both as green fodder and as hay, and perhaps it may prove itself a valuable fodder-plant in subalpine regions. But there is an inconvenience by the hay-making: the plant forms big semispherical tufts which render the mowing with scythe difficult. The green turfs formed by its web of roots are very compact, hence preferred by the natives for house-building

Very common on Disko and the Mainland around Disko-Bay; also common in the archipelago of Egedesminde district and southwards along the coast down to Holsteinsborg.

Still frequently to be found at the tent places in the fjords, but else very rare here or quite absent.

Possibly it may be found isolated in alpine habitats; we did not find it during any of our excursions on the hills although we searched for it.

In N. Strømfjord it was very common on the islet Taseralik at the mouth of the fjord, where yearly 3—400 men and women meet; at the tent- and fishing-place Eqaluarssuit it was found in great abundance, but locally; but not at any of the tentplaces within that, not even in the hills.

In the region of Holsteinsborg it has been found a few times in the vicinity of Amerdloq-Fjord down to 66°45′ and for the present this place must be etablished as the south limit of its continual distribution. It has been recorded isolated from the head of Kangerdluarssuk-Fjord at Frederikshaab by Th. Holm (Englers Jahrbücher VIII, p. 200), but the specimen does not exist. Mistake of identity is excluded; perhaps it was alpine here, but this is not recorded by the collector.

Northern type; in East Greenland known to ca. 68°, but does not occur on Iceland (yet in Scottish mountains).

Ascends, following the bog-formation, to the snow-line.

Abundantly flowering and fruiting.

Hibernates covered by snow.

Λ 31. **Alopecurus aristulatus** Michx.

Rooted in small ponds and on lake-shores with floating leaves and stalks. During exceptionally dry summers to be found trailing on the

desiccated borders preferably in the shade of overhanging *Carex*-tufts, but withers when exposed to long exsiccation.

Seems in Greenland to be rare, but occurs widely distributed in isolated growths.

Disko: The south coast, in Blæsedalen (P.); Diskofjord: Evqitsoq 69°30′ (E. P.); Nordfjord: on the southern side of the mouth 69°55′ (P.).

Mainland: Sarqaq about 70° (Th. Fr., re-found by E. P.); Taseralik 67°25′ (E. P.); N. Isortoq 67°10′ (V.); Holsteinsborg 66°55′ (V.); at the head of S. Strømfjord (Jens.).

In deeper water floating and sterile forms are common (cfr. SIMMONS: Über einige lappl. Phanerog. Arkiv för Bot. 6, No. 17, p. 4; idem: Bot. Not. 1908 p. 121—128).

A decided southern type, south of the area known from Godthaabsfjord and a few localities between 60° and 62°.

The north limit at Ikerasak 70°30′ (Vh.).

Ordinarily flowering and fruiting.

Hibernates under or enclosed in ice.

Agrostis canina L.

Recorded from Egedesminde by BERLIN (Öfv. K. Vet. Ak. Förh. 1884, No. 7, p. 76), but the author himself seems to doubt the correctness of his own determination. Probably confounded with the following species, otherwise only known from the west coast between 60° and 62°.

Λ 32. **Agrostis borealis** HARTM. (*A. rubra* WAHL p. p.).

In dry stony soil: dry rocky-flats, rarer on gravel and dry heath-vegetation.

Disko: Common in the gneiss-domain of the south coast; strangely not found on basalt.

Mainland: Common in the gneiss domain, especially southwards at some distance from the coast.

In the districts of Jakobshavn and Christianshaab the localities are situated at some distance from each other though rather numerous. Not found within the basalt and sandstone-domain of Nûgssuaq.

A southern type, north of the area found on Qaratsap-Nunatâ 70°30′ and at the head of the fjords inland from Prøven 72°30′ (Th. P.) this hitherto being the north-limit.

Ascends the favourably exposed hill-slopes to at least 500 m.

Flowers and fruits abundantly.

No doubt often without any cover of snow during winter.

V 33. **Arctagrostis latifolia** (R. Br.) Griseb.

In bogs and vigorous heath, scarce on gravel in riverbeds.

A decided northern type, the southmost occurrence of which is to be settled within the area.

Disko: The northland here and there; the southmost locality is on the southern side of Nordfjord about 69°55′ (P.). — Hart l. c. p. 304 states the range of the species to lie between 69°14′ and 81°51′. The first mentioned latitude corresponds to that of Godhavn, but as I have not been able to re-find the easily recognizable species here during a stay of 12 years, I am inclined to consider the record as erroneous. — Hare Ø (P.); Nûgssuaq, the Interior (P.); and along the coast of Waygat; the southmost localities here are Atanikerdluk (Th. Fr.) and Sarqaq about 70° (V.); Eqe, at the edge of the inland ice at a height of 700 m is the southern limit of the species (69°44′).

Abundantly flowering and fruiting.

Covered by snow during winter.

i 34. **Calamogrostis purpurascens** R. Br.

In sandy and gravelly localities in riverbeds and deltas, on rock-ledges and in crevices; rare in heath.

Disko: Rather common on the northland especially on the coast of Waygat and in the adjacent valleys as well as in the interior; at Mudderbugt, in the sand-stone-domain. Diskofjord: at Ikineq, on gneiss-rocks and gravel. Otherwise not observed on the southland (P.).

Hare Ø (P.).

Mainland: Common in the sandstone-domain of the coast of Nûgssuaq (P.), and known from numerous localities between Torssukátak and the Sydostbugt (P.). South of Disko-Bay it seems to be perceptibly scarcer and mostly to occur at some distance from the out-coast. The rapids of Arfersiorfik (K.). N. Strømfjord: Sarfarssuaq (P. & E.) and the vicinity of the fjord-arm of Ugssuit, common (P.& E.); N. Isortoq 70°10′ (V.); Ikertôq Fjord (V.); Itivneq 66°58′ (W. & H., P. & E.); Sarfánguaq 66°55′ (W. & H.); S. Strømfjord 66°35′ (Jens.).

This species has formerly been included among the southern types by me (Medd. om Grønld. 50 p. 386), but I now doubt the correctness of this statement.

South of the territory treated of here it has been found a few times in West Greenland down to ca. 61° (in H. H. I have not seen specimens from localities south of 64°!), but there is, in fact, nothing strange in the occurence a plant of a high-arctic range to the south of its continual distribution, for instance on the hills whence they occasionally are washed down in the lowland. The southern limit therefore will always be less distinct than the northern.

But according to my observations in the regions around Disko-Bay and northwards (made after the publishing of the above mentioned paper) the species occurs more frequently northwards, and on

Disko it just occurs in the area of the northern types, being rarer on the southland.

At the northmost known locality of the species: Laksefjord 72°30′ it was too common for settling this place as the northern limit.

Therefore I am inclined to consider it a northern type in Greenland, belonging to that contingent of West-American arctic species migrated to Greenland over Smith-Sound. (Cf. Simmons: Phytogeography p. 135 sqq. and Map. I).

On favourable expositions, i. e. rather warm sandy-gravelly tracts, where it does supplant either other Gramineae or other vegetation it is able to become so abundant as to characterize the vegetation, thus in the inmost of the Kûgánguaq-valley on the northside of Disko; but it never forms dense carpets as other species of the genus.

In the sandstone-domain of Waygat it ascends to considerable heights.

Abundantly flowering and fruiting.

Undoubtedly often snowless. The living parts of the shoots are protected by the withered remains of the leave sheaths.

Λ 35. **Calamogrostis hyperborea** Lange, Robinson & Fernald.

In vigorous, sandy and moist localities in herb-mats and thickets.

Disko: The south coast 69°15′ very rare near Udkiggen at Godhavn (Nygaard!); Østerdalen near the hot springs (Th. P.!).

Mainland: Pâkitsoq 69°28′ (V.); Tasiussarssuaq 68°20′ (Bg.); Sofiehavn 68°20′ (Bl.); N. Strømfjord: several places (Korn.; Holst; Th. Fr.) Ipiutarssuaq 67°44′ very common (P. & E.); vicinity of Holsteinsborg: Sarfánguaq 66°58′ (E. P.); Maligiaq 66°58′ (P. & E.); Naujarssuit in Qeqertalik 66°44′ (P. & E.).

A decided southern type, the northmost localities is Ũmánaq (Rink teste Lange) 70°40′. South of the area found in several localities. S. of 64° the localities are lying rather closely together, but it is probably nowhere common.

Often forming large dense carpets.

All the above mentioned localities are in the lowland.

Abundantly flowering and fruiting.

Covered by thick layers of snow during winter.

Λ 36. **Calamogrostis neglecta** (Ehrh.) Fl. der Wett.

On moist sand, especially on lake-shores and along water-courses.

Disko: The southland from Mudderbugt to Diskofjord included, rather common (P.); Laksebugt 69°40′; the valley of Iterdlagssuaq 69°45′ (P.) in Mellemfjord; in valleys in the northwest-land at 70°11′ (P.); Hare Ø (P.).

Mainland: From the tracts of Holsteinsborg to the icefjord of Jakobshavn rather common, especially at some distance from the outcoast (P.). Becoming rarer northwards; Ritenbenk (Bg.); Påkitsoq-fjord (V; Bg.; P.); Atanikerdluk (Htz.); Nûgssuaq (P.).

A southern type with hitherto known north limit on Schades Øer 71°22′ (P.).

Often forming carpets recognizable at a distance by the green colour and without admixture of other species.

Abundantly flowering and fruiting.

Hibernates covered by snow and often by ice.

A 37. **Calamogrostis Langsdorfii** (Link.) Trin.

On favourably exposed, moist hill-slopes, along rivulets and especially at the edge of thickets.

Disko: Very rare; at Godhavn 69°15′ (R. Br. Wetherill, not re-found by us; perhaps extinct owing to the felling of willows; near Skansen (Rikli!), and in the valley of Kûgssuaq 69°30′, within this locality (L. Geissler).

Mainland: Qeqertaq 70°, seen in the houses of the natives used as boot-straw (P.); Påkitsoq-fjord several localities (V.; P.); Egedesminde 68°40′ (P.).

From here southwards becoming common in the fjords and the valleys of the larger islands; in the interior around of N. Strømfjord very common (P. & E.), as well as in the fjords inland from Holsteinsborg (P. & E.).

A decided southern type having its northern limit at 70°.

As a rule forming extensive dense carpets. Because of the length, the delicacy and the toughness of the straw highly valued as boot-straw by the natives, being the best material for this purpose. From Egedesminde southwards often used for the making of domestic industrial objects, for instance trays, baskets and caps.

All the above mentioned localities are in the lowland.

Abundantly flowering and fruiting; at the northernmost localities not annually getting ripe.

Hibernates covered by thick layers of snow.

⊥ 38. **Deschampsia flexuosa** (L.) Trin. var. **montana** (L.) Hartm.

Very rare, not common till the southmost part of Greenland 60° — 61° (Ros.).

In the area found at Itivneq 66°58′ (W. & H.); besides recorded by Sørensen from Godhavn 69°15′. Determined by L. K. Rosenvinge and approved by Gelert in Fl. Arctica, but the specimen may not originate from Godhavn. The only member of the genus, which I have found at Godhavn after a search extending through many years, is a form belonging to the following species.

A pronounced southern type.

V 39. **Dechampsia caespitosa** (L.) BEAUV. var. **pumila** LEDEB.

On moist sandy clay, sometimes almost submerse on lake-shores; very rare.

Disko: Godhavn 65°14′ near Udkiggen (Rikli; P.); the west coast (Wetherill); the north coast: Gieseckes Dal, 70°15′ (P. 1902 det. C. H. OSTENFELD: Medd. om Grønld. 43 p. 13, re-found 1916 P.). Hare Ø (Nath.).

A decided northern type, the above mentioned localities representing the south limit; for the rest only known from a few localities on the coast of East- and West Greenland (Cf. OSTENFELD, l. c. and PORSILD Medd. om Grønld. 50, p. 365).

On land abundantly flowering and fruiting, being only rarely submerse.

Hibernates covered by snow and ice.

Λ 40. **Deschampsia alpina** (L.) R. & SCH. (Syn. *Aira caespitosa v. borealis* TRAUTV.).

A pronounced southern type common south of 64° and only known from a few localities in the southmost part of the area.

The region of Holsteinborg 66°55′ (Th. Fr.); S. Kangerdluarssuk about 67° (W. & H.); Eqaluarssuit in N. Strømfjord 67°36′ (P. & E.) several places on sandy, clayey riverbanks.

The last mentioned locality for the present the north limit.

The species was here abundantly flowering, but viviparous. Everywhere we found spikes a year old weighed down by the early fall of snow, the bulbils being not yet ripe and ready for dispersal. Several of the specimens had preserved their power of germination, but the power of migration of the species seemed to be lost.

I 41. **Trisetum spicatum** (L.) BEAUV.

On fell-field, clefts, vigorous heath, herb-mats, thickets, strand-dunes, often in manured soil at the houses and below fowling cliffs (f. *villosissima* Lge.), but not on newly-formed moraine; f. *laxior* Lange is a shade-form from thickets.

Very common throughout the whole area.

Neither southern nor northern limit in Greenland.

No doubt ascending the hills to the snowline, but not among the pioneers of the newly-formed moraine.

Abundantly flowering and fruiting.

Undoubtedly always covered by snow during winter.

T 42. **Dupontia Fisheri** R. Br.

In moist marsh-land and meadows or submerse in shallow pools and lagoons.

A pronounced high-arctic plant with southmost occurrence in the northern part of the area.

Disko: On the northland from several localities between Qutdligssat at the Waygat about 70° and the head of Nordfjord and the valleys herefrom (P.).

Mainland: The coast of Nûgssuaq from 70°15′ to the mouth of the great river, about 70°30′ (P.).

In the localities, from which I have observed this plant, as well within the area as farther northwards, it was growing near the shore; a single exception is the great valley of Nordfjord where it grows on newly raised fjord-bottom.

Therefore I am inclined to consider the plant as halophilous.

Hence all the localities in the lowland.

Occurs forming widely extended carpets almost free from other species and easily recognizable by the striking red-brown colour. In water of some depth the whole carpet is ordinarily sterile, but near the shore and on dryer ground it is abundantly flowering and fruiting.

During winter covered by snow and, as a rule, also by ice.

I 43. **Phippsia algida** (Sol.) R. Br.

In moist localities among other Gramineae, in heath and bogs, in manured soil near the houses and the deserted settlements, at pools, on fowling islands and in the hills at the border of the melting snow-fields.

Very common throughout the whole area, in the southern part however, confined to the belt of rocks and islands girding the coast; or in the mountain region of the interior, the ground of the lowland here being occupied by competitors.

At the settlements it has found its way, moreover, to the Danish gardens and together with *Stellaria media* it has become a trouble-some weed in the hotbeds. Here it develops to a phantastic size compared with its appearance in nature.

A widely distributed arctic plant, in Greenland without neither northern nor southern limit, decreasing however, in frequency southwards, rather a northern type.

i 44. **Poa pratensis** L.

In nearly every kind of soil from the coast up to considerable altitudes. On luxuriant slopes and on bushland very vigorous and often forming dense extensive associations. Near new settlements it conquers

the manured soil and holds its own for several years until finally it is overpowered by *Alopecurus alpinus*. In rich and manured soil adequately irrigated during the period of vegetation it attains, about Disko Bay, a height sufficient for hay-making.

Very common in the whole area.

Widely distributed in Greenland, without southern and probably also without northern limit.

Flowering and fruiting abundantly.

Most regularly covered by snow during winter.

! 45. **Poa arctica** R. BR. (*P. cenisia* Autt. non ALL.).

In dry heath, in stony, gravelly or rocky soil a little rarer than the preceding species in the lowland, becoming commoner upwards.

Common throughout the whole area, in the fjords of the southern parts; scarce, however, in the richly plant-covered lowland.

Widely distributed arctic plant, without northern limit in Greenland; also found down to Cape Farewell, but according to ROSENVINGE scarce and principally alpine in South Greenland. Hence we consider the species as a northern type.

Ascending the hills to the snow-line.

Abundantly flowering and fruiting. Seldom occurring in pure associations.

Probably often snowbare during winter.

i 46. **Poa alpina** L.

In soil rich in humus, on herb-slopes amongst thickets and in luxuriant heath, sometimes amongst mosses at springs, or in rock-crevices, more seldom in sandy or clayey soil poor in humus along watercourses.

Disko: Common in the southern part and in the two southernmost fjords, rarer in the southern parts along the Waygat, and here mostly confined to springs and other luxuriant spots. Nordfjord, occurring in the big valleys. West coast; locally, but rare. North coast: not observed.

Hare Island: south coast, rare (P.).

Mainland: rare on the coasts of Nûgssuaq peninsula, becoming more abundant south of Torsukâtak, southwards common except on the smallest and outmost lying islets of the archipelago.

As to distribution on Disko resembling the southern types, to which it is to be reckoned. Widely distributed in Southern Greenland without southern limit. The exact northern limit of the species is unknown, its occurring to 74° is certain, from places north of Cape York it has often been stated in literature, but SIMMONS has proved most of the statements to be erroneous or at least improbable.

P. alpina often characterizes rather large areas, but it never forms dense associations.

On favourable spots, ascending the slopes to considerable altitudes.

Abundantly flowering and fruiting. Viviparous specimens have never been seen by us.

Snow-covered during winter.

⊥ 47. **Poa laxa** Haenke.

In Fl. Arct. Gelert states the distribution of this species as lying between 60° and 70°!; the sign of ! indicates that he has seen and approved the determination of the specimens from within these limits. But in H. H., revised by Gelert, I did not in 1910 find any specimens gathered from localities north of 66°55′. I have various specimens myself from the coasts of Disko and Nûgssuaq corresponding fairly well with the diagnosis of *P. laxa*, but owing to the lack of figures and exactly determined Greenlandic material of *P. laxiuscula* Lange I dare not quite trust these determinations, the closely related *P. glauca* being so very much variable.

A southern type.

Abundantly flowering and fruiting.

Hibernates covered by snow.

T 48. **Poa abbreviata** R. Br.

On barren sand and gravel and newly formed moraine. A high-arctic species found a few times in the northmost part of the area.

Disko: The north-western coast: Igdlorpait 70°5′ (Th. Fr.); the coast of Waygat: Kûgánguaq 70°15′ (Th. Fr.; P.); Asuk 70°10′ (Th. Fr.; P.); Qutdligssat 70° (Htz.).

These localities represent the hnown southern limit in Greenland.

Here flowering and fruiting.

No doubt often snowless.

I 49. **Poa glauca** M. Vahl.

On fell-field; gravelly, sandy and stony soil, newly formed moraine, sand-shores and dunes, but also to be found under better conditions, for instance, in manured soil and thus frequent at the settlements. Varies without limits according to the quality of the place. Often forming extensive patches, especially when manured and irrigated during the period of vegetation. Not well adapted to forage plant for cattle, having only a few leaves and the straw being short, stiff and too early ripening.

Very common throughout the whole area.

Widely distributed species without neither northern nor southern limit in Greenland.

Ascending from the coast to the snow-line.
Abundantly flowering and fruiting.
Often snowless during winter.

⊥ 50. **Poa nemoralis** L. var. **glaucantha** BLYTT.

Almost the same applies to this southern type as to *P. laxa*. LANGE gives the distribution between 60° and 69°20′ and this GELERT approves by his sign!; but in H. H. revised by GELERT no specimens occur from localities north of ca. 67°. The localities recorded north hereof are: Disko (WALKER), some localities near Jakobshavn (R. Br.) and Christianshaab (W. & H.).

In addition I have referred to this species a grass from a few localities in N. Strømfjord: Eqaluarssuit 67°36′ and Ipiutarssuaq 67°44′ (P. & E.).

The plant was here growing in thickets and seemed to have been fruiting the preceding year.

The above mentioned localities are from the lowland.

Hibernates under thick layers of snow.

Puccinellia.

The species belonging to this difficult genus have recently been thoroughly studied by various American and European botanists. Thus M. L. FERNALD and C. A. WEATHERBY in Rhodora 18. 1916 gave a description of the species in Eastern North America, accompanied by extensive synonymic and excellent figures. And on the European and Arctic species Dr. O. R. HOLMBERG, has published various smaller papers as precusory studies for an exhaustive monograph.

As I have had an opportunity of comparing my M. S. and my field-notes, but not my herbarium-plants, with the material in H. H. revised and labelled by Dr. HOLMBERG, it seemed desirable to bring the names of the species here treated of in accordance with the nomenclature of HOLMBERG's monograph, still unpublished. For that purpose my friend Dr. HOLMBERG kindly provided me with a list of the combinations to be used.

For the explanation of those combinations and their synonymic, in shorthy for the entire systematic part of the classification, the reader is referred to HOLMBERG's own work soon to be published.

V 51. **Pucinellia Vahliana** (LIEBM.) SCRIBN. & MERR. (Incl. *Glyceria Kjellmani* (LANGE).

In open spots in the heath, on newly formed moraine and on clayey and sandy slopes, but not halophilous.

Disko: The Northland from about 70°0′ on the coast of Waygat and around to the Nordfjord gathered from several localities, no doubt rather common (P.); in the great valleys from the head of Nordfjord 69°50′ (P.). Hare Ø (Nath.; P.).

Mainland: The westcoast of Nûgssuaq peninsula and the Waygat-coast down to Paotût 70°12° rather common (P.).

Decidedly a northern type having its south-limit at the mentioned localities.

Abundantly flowering and fruiting.

Probably sometimes snowless during winter.

I 52. **Puccinellia phryganodes** (Trin.) Scribn. & Merr. (*Catabrosa vilfoidea* Anderss.).

On moist sand and clay at the sea-shore; in the Basalt- and Sandstone-domains, for instance, within the dunes of the beach along the edges of lagoons; on alluvial formations at the mouths of rivers in the interior of the fjords. It attains to its highest development when regularly inundated by the tide, and in such places it forms a sort of marsh (Porsild: Medd. om Grld. 65 p. 194, 217, Fig. 16. Résumé français p. 290, 299). Great areas are here covered by its trailing shoots and these form a low, but often very dense, purple-greenish carpet. In this condition it is always sterile. But when the sand-drifts arrive, the ground is raised so much as to prevent the high-water from but occasionally reaching it, the vegetative power is ceasing, and then, as a rule a few flowering specimens are to be found at the margin of the carpet. Apparently much rarer on the gneiss-coasts. When the rocks are falling straight into the water there will not be any room for the plant, but in the smallest inlet, with but the slightest trace of sand or clay, we need not search it in vain.

Very common throughout the whole area.

Widely distributed in Greenland without southern — and no doubt without northern limit too.

Always covered by snow and ice in the winter.

Λ 53. **Puccinellia retroflexa** (Curt.) Holmb. apud Lindman: Svensk Fanerogamflora 1918 p. 97.

In Ostenfeld: Flora Arctica p. 127 Gelert, united a considerable number of Puccinellias, discerned by Lange, under the name of *Glyceria distans* (L.) Wahl. But according to Holmberg's investigations this is erroneous, as the true *Puccinellia distans* (L.) Parl. does not occur at all in Greenland. Some of the plants, referred by Gelert and authors following him to this species, belong in fact to *P. retroflexa* (Curt)) Holmb. or rather to a subspecies *borealis* Holmb., still unpublished.

Of this new subspecies I have seen several sheets in H. H., labelled by Dr. Holmberg. According to that material the range of the plant will lie between the extreme south of Greenland and the southern parts

of our area, where it is very scarce. Hence it must be considered a southern type in West Greenland.

Not knowing *P. retroflexa* and its several forms myself, I cannot add any observations as to its occurrence.

About the remaining plants contained in the »*Glyceria distans*« of GELERT see the following numbers 54—56.

V 54. **Puccinellia angustata** (R. BR.) RAND & REDF.

At the sea-shore but also intermingled in the not-halophilous vegetation or occurring on the peat from previous land-vegetation now killed by the salt water; besides in all the places which agree with the var. *vaginata* and together with this variety.

A northern type, rather common on the coasts of Waygat. Besides from numerous localities around Disko-Bay becoming scarcer down the archipelago of Egedesminde; the southern limit is about 67°.

Abundantly flowering and fruiting.

Hibernates covered by snow.

V 55. **Puccinellia angustata** var. **vaginata** (LANGE). HOLMB. hoc loco!

The most common *Puccinellia* in our area.

At the sea-shore, mostly on clayey, moist-sandy ground, or among other strand-vegetation; normally forming semi-globular cespits and the straw decumbent and closely pressed to the ground. Stands manuring very well, and in exceedingly manured soil, for instance at settlements or on small fowling-islets the tufts become hummocky and the newly hatched youngs of gulls and terns are able to hide in the channels under the leaves of the cespits.

Very common throughout the northern part of the area.

Like the preceding a northern type.

Flowers and fruits in great abundance.

Hibernates covered by snow and often by ice.

Λ 56. **Puccinellia arctica** (HOOK) FERN & WEATH.

By this name I understand a rather coarse grass, habitually differing widely from the preceding by its erect growth. It occurs on plains, raised marine clay, on clayey sandy terraces at the head of fjords and along the banks of the rivers falling into these.

Much scarcer than the preceding species because of the absence of suitable places; but covering extended areas when occurring, though not forming dense carpets as the foregoing.

One of the main-plants of the clay-plains in the interior, from the districts of Holsteinsborg to Disko Bay. Besides from some localities on the shores of Waygat.

Probably a southern type in West Greenland.

Abundantly flowering and fructificating.

I 57. **Puccinellia tenella** (Lange) Holmb. hoc loco! (Incl. *Glyceria Langeana* Berl.).

In localities similar to those of the preceeding species, rarer or overlooked because of its diminutiveness.

No doubt to be found in a great many places when only searched for.

Disko: In several places near Godhavn (P.).

Hare Ø (P.).

Mainland: From several localities in the Sydostbugt (Htz.; P.); the archipelago of Egedesminde: Kullen (K.); Kangâtsiaq (Bl.; K.); Augpilagtoq 68°44' (K.).

Abundantly flowering and fruiting.

Hibernates covered by snow.

i 58. **Festuca ovina** L.

In all sorts of soil from the most barren gravel and sand, in crevices between boulders and pebbles to heath, vigorous herb-mats, thickets and manured places.

Very common throughout the whole area.

Being common in the littoral halophilous zone of the coast, it ascends the hills to the snow-line.

Widely distributed in Greenland; if the rather much deviating *F. brevifolia* R. Br. is to be reckoned as a form of *F. ovina* the species has neither northern nor southern limit. Otherwise the northern limit has to be searched for somewhere at the shores of Melville Bay.

Very much variable, and numerous forms and varieties have been described. To be sure most of them are dependent upon the quality of the native place. I have not been able to elicit whether hereditary constant forms occur too or not.

Abundantly flowering and fruiting.

In many of the native places hibernating without cover of snow.

Λ 59. **Festuca rubra** L. var. **arenaria** Osb.

On fairly moist sand, for instance, along the shores of rivers and lakes; among other Gramineae in heath; at the base of dunes and often in manured soil or in thickets.

Often forming dense carpets.

Common throughout the whole area, but more isolated in the basalt-domain and the northern part.

A southern type, north of the area only known from a few localities, the northmost at 72°.

Undoubtedly a lowland-plant throughout the whole area.

Rather much variable, but not as much as the preceding one.

Abundantly flowering and fruiting.

Covered by snow during winter.

⊥ 60. **Agropyron violaceum** (Horn.) Lange.

On sand and sandy clay at the sea-shore, but also to be found at considerable distance from the coast; ascends to considerable altitudes.

Disko: Kûgánguaq (Th. Fr.); at Mudderbugt? (P.) the determination doubtful, the plant being observed on a sled-journey in the winter.

Mainland: The Waygat-coast of Nûgssuaq-peninsula, common from Atâ 69°20′ to Atanikerdluk (Th. Fr.; Htz.; P.). The tract of Holsteinsborg: Ikertôq Fjord 66°50′ (V.); Itivneq about 67° (V.; W. & H.); hence not observed till 60° to 62°.

A decided southern type.

Abundantly flowering and fruiting.

Now and then snowless during winter.

Λ 61. **Elymus arenarius** L. var. **villosus** E. Mey.

On sandy shores often forming dunes (cp. Porsild: Medd. om Grl. 25 p. 135 ff. fig. 3—4); also in manured soil at the settlements and under, as well as on the fowling-cliffs; here often ascending to considerably altitudes. On Disko and Nûgssuak-peninsula very common in the basalt- and sandstone-domain, here being the most conspicuous plant of the sand-shore forming great dense growths.

More scarce on the rocky coasts of the gneiss-domain, but occurs in the smaller creeks ending in sand-formations. The plant is to be found far into the valleys of the fjords following the banks of the great rivers, but sometimes it is absent over great distances in the interior of the fjords owing to the lack of suitable conditions.

Commonly used by the natives for boot-straw when they cannot get *Calamogrostis Langsdorfii.*

A southern type only known from a few localities north of the area; the northmost at 70°29′ (P.).

Abundantly, but late flowering (at Disko-Bay) and only fruiting after favourable summers.

A decided winter-stander, but we have often found the unripened

grains in the spikes during the whole of winter. But an intense and patient search will always result in the finding of seedlings.

Normally only the spikes protrude above the snow.

XI. Cyperaceae.

I 62. **Eriophorum polystachion** L. (*E. angustifolium* ROTH.).

In moist moss-bogs and marshes along the shores of lakes and brackish lagoons, often in great quantities.

Very common throughout the whole area, but certainly not as widely distributed as the following species.

Very common in Greenland without southern or northern limit, ascends to considerable altitudes just as far as the bogs and pools are thawed up every day for at least a couple of months, even when they are covered with ice during the night.

F. *ferrugineum!* Bristles reddish, nearly as in *E. russeolum Fr.*, upwards paler.

At Qámavik on the southern side of the Nordfjord I saw a great growth of f. *ferrugineum*, all the plants of which having rust-coloured bristles. The other species were growing just in the neighbourhood and partly mingled with it, but kept the normal colour of the bristles; I did not observe any intermediate forms.

Abundantly flowering and fruiting.

Hibernates covered by snow.

I 63. **Eriophorum Scheuchzeri** HOPPE.

In localities similar to those of the preceding species, still more common.

Note: The upper sheaths often somewhat swollen and perhaps this is the reason why such specimens in dried condition have been determined as *E. vaginatum* L., which species does not occur in Greenland.

It seems to be a pathological phenomenon due to the effect of the night-frost in the springtime. Phenomenons similar to this have been observed on various species of the Gramineae (comp. FR. BUCHENAU: 2. Deutsche Nordpolfahrt, II, 1, Botanik p. 53, who attributes this to another cause).

Abundantly flowering and fruiting.

Hibernates covered by snow.

Λ 64. **Heleocharis acicularis** (L.) R. BR. f. **submersa** HJ. NILSS.

Forming carpets at the borders of small, shallow, not quite dried-up lakes and ponds.

Disko: The north-eastern coast: Ingnangnaq 70°17′ (P.).

Mainland: Sarqaq about 70° (E. P.!); Claushavn (Bg.); Christianshaab (Htz.); Orpigssuit (Htz.); Nivâq-Bugt 68°32′ (K.); Sofiehavn 68°20′ (Bl.).

Besides found a few times north of the area to 71°42′ (P.).

Though not found south of the area it is no doubt a decided southern type, overlooked because of its diminutiveness and undoubtedly to be found in several localities.

From all the localities the plant was quite sterile; at the north limit it was also found on desiccated soil, but without any trace of flowers. Thus it does not seem to have any power of dispersal.

Hibernates enclosed in ice.

Λ 65. **Scirpus caespitosus** L. (*Trichophorum austriacum* PALLA.).

On moist spots in heath and moss-bogs or along the borders of small brooks; occurs isolated, but always in great quantities.

Disko: In several places on the southcoast.

Mainland: From Torssukátak about 70° southwards from a great many localities as well in the inland as near the coast. From the fjords in the southern part of the area only from a few places, perhaps owing to the overlooking of the plant. We have not observed it neither in N. Strømfjord nor in the fjords inland from Holsteinsborg.

A southern type common south of 64° (Ros.) and north of the area quite isolated at 72°27′ (P.).

Ascending the hills to 4—500 m.

Abundantly flowering and fruiting.

Hibernates covered by snow and sometimes by ice.

I 66. **Cobresia Bellardii** (ALL.) DEGL. (*Elyna spicata* SCHRAD. *Cobresia scirpina* WILLD.).

On dry rock-ledges, bare spots in heath-vegetation and in gravelly places.

Disko: The southcoast in the gneiss area and at the coasts of Waygat in the sandstone-domain. Hitherto not observed on basalt; always scarce (P.).

Mainland: On the coast of Nûgssuaq peninsula from the sandstone-domain; from the gneiss-domain southwards here and there; the places forming a continuous area of distribution. In the southern part observed in Godthaab-fjord and 60°—61°; likely overlooked in the interjacent localities.

Widely distributed in West Greenland, though only found to about 71°; but being found, not only on the east coast north of this latitude, but also on either side of Smith's Sound, it is likely to occur on the interjacent part of the west coast.

Abundantly flowering and fruiting.

Undoubtedly snowless now and then.

⁝ 67. **Cobresia lipartita** (ALL.) DALLA TORRE (*C. caricina* WILLD.).

On warm rock-ledges, sunny and rather dry heath and from the outskirt of thickets.

Disko: Lyngmarken at Godhavn 69°15′ (Th. Fr.).

Mainland: Here and there, but the rather numerous localities form together a continuous area of distribution; from the fjords inland from Holsteinborg following the interior part of the gneiss-land to Nûgssuaq peninsula and here only in the gneissic part northwards to the interior of the Nordost-Bugt.

The northmost locality is on Ubekendt Ejland 71°12′ (P.).

South of this domain known quite isolated at 64°45′. Otherwise not found till the southern coast of Ellesmere Land and on the east coast of Greenland at 71° and 73°20′.

Seems thus to be a northern type.

Abundantly flowering and fruiting.

Undoubtedly snowless now and then.

I 68. **Carex nardina** FR.

In barren, sandy and gravelly places; on open heath and often characterizing this vegetation, but rare in stony soil.

Very common in the basalt and sandstone areas from the coast to the snow-line; scarcer in the gneiss-land and often absent in vigorous, dense vegetation of the lowland, but to be found on the hills or in barren places. This is especially the case in the great fjords, but occasionally also to be found here in the lowland for instance, on gravelly river-banks or on the slopes of marine layers of clay, where they have been cut through by streams.

Has neither southern nor northern limit in Greenland, but is scarce in South Greenland, and here it is to be reckoned as an Alpine species, only occasionally and by chance descending into the lowland.

Abundantly flowering and fruiting.

No doubt often snowless during winter. The living part of the plant, however, is very well guarded by the compact, involuted remains of the leaf-sheaths.

Λ 69. **Carex capitata** SOL.

In sandy soil, open spots on the heath, rock-ledges and clefts.

Disko: Only seen a few times in the gneiss-domain of the south coast (P.).

Mainland: Paotût 70°12′ (Htz.); from Torssukátak southwards there is a great many localities as well in the inland as, for instance, in the archipelago of Egedesminde. Nevertheless we did not see it in N. Strømfjord nor in the fjords inland from Holsteinsborg, though observed here several times by other collectors.

A southern type, north of the area only known from two localities in the interior part of the Nordost-Bugt.

Abundantly flowering and fruiting.

Undoubtedly snowless now and then during winter.

I 70. **Carex incurva** LIGHTF.

On sandy coasts, sometimes also in manured soil at the settlements.

Disko: The southcoast at Godhavn 69°15′ (Th. P.) at some small bogs near a little lagoon.

It appeared at the Arctic Station, which lies a few hundred meters from the sea, after the building of the houses and grows now in mouldy manured soil along a drain and forms here a dense carpet. Rather common on Nord-Disko; Hare Ø.

Mainland: Waygat-coast of Nûgssuaq peninsula. In the gneiss-domain isolated and scarce, for instance, Eqe 69°45′ (P.); several places from the sandy shores around Sydost-Bugt (V.; Htz.; P.); Kangâtsiaq 68°15′ (Bg.) and observed a few times in the surroundings of Holsteinsborg.

In West Greenland known from 60° to 61° and from 65° to 71°30′, but besides from the coasts of Smith's Sound; no doubt often overlooked.

Even without flowers very easily distinguished from other species. But in nature it is not very conspicuous, not even with spikes, these normally being bent down and hid among the leaves.

f. erecta O. F. Lang seems to be a shade-form.

Abundantly flowering and fruiting.

Hibernates covered by snow.

⊥ 71. **Carex pratensis** DREJ.

At the foot of a fowling cliff among other tall vegetation: Qeqertalik-Fjord, Naujarssuit 66°44′ (E. P.).

A decided southern and rare type, for the rest only known from a few places in Godthaabfjord and Tunugdliarfik. The above mentioned locality thus the northern limit of the species.

Here abundantly flowering.

Hibernates covered by a thick layer of snow.

Λ 72. **Carex Macloviana** d'URV. (*C. festiva* DEW.).

On fertile heath-slopes, herb-mats and in thickets.

Disko: The south coast around Godhavn 69°15′ several localities; rather common (P.); Diskofjord at Kuánerssuit 69°35′ (P.).

Mainland: Sarqaq 70° (V.); Pâkitsoq 69°28′ (Sør.); Egedesminde (W. & H.); S. Kangerdluarssuk (W. & H.); Holsteinsborg several localities (Th. Fr.; W. & H.).

A decided southern type, the known northern limit of which has been mentioned above.

In South Greenland it becomes gradually common and is also to be found at some considerable altitudes (Ros.).

Abundantly flowering and fruiting.
Hibernates covered by a thick layer of snow.

⊥ 73. **Carex canescens** L.

Disko: In 1908 I collected a *Carex*-species at Kûgaq at Mudderbugt; it was noticeable because of its stature and vigour and by the pale, rather small, remote spikelets. With some doubt I have determined it to *C. canescens* though the beak of the outricles are somewhat too long and resemble that of *C. lagopina*. I brought some of the tuft away with me and planted it at home, and it has retained its aspect unchanged since, but now it is gradually overcome by the surrounding vegetation.
Mainland: In Kangerdluarssuk (W. & H.); Ikertôq Fjord 67°50′ (V.).

A decided southern type. The above mentioned locality being its northern limit.

South hereof only observed a few times; from 60° to 61° however being rather common (Ros.).

Flowers and fructificates.

Hibernates covered by snow.

⊥ 74. **Carex brunnescens** (Pers.) Poir (*C. vitilis* Fr.).

Among grass, in thickets.

Mainland: Holsteinsborg, 66°55′ (Th. H.).
S. Kangerdluarssuk 67° (W. & H.); Ikertôq Fjord 66°50′ (V.).

A decided southern type, the above-mentioned locality being the north limit.

The distribution resembling that of *C. canescens*, but, according to Rosenvinge, somewhat more frequent and undoubtedly common from 60° to 62°.

Flowers and fructificates.

Hibernates covered by snow.

Λ 75. **Carex lagopina** Wahlenb.

On vigorous heath, herb-mats, thickets and rock-ledges.

Very common throughout the whole area following old vegetation. Ascends the hills, but does not belong to the pioneers on new-gained soil, for instance, moraine etc.

Widely distributed in Greenland, particularly a southern type, The north limit at about 73°.

Abundantly flowering and fruiting.

Hibernates covered by snow.

i **76. Carex glareosa** WAHLENB.

At the shore among other vegetation.

When having room enough it forms dense carpets or marshes along the shore, for instance, at the borders of lagoons inland from the beach.

C. glareosa grows, just like the other plant characteristic of the shores of Disko Bay, *Puccinellia angustata* v. *vaginata*, in semi-globular tufts with the fruiting stalks lying densely pressed to the ground and radiating in all directions. Stands manuring very well.

Very common throughout the whole area; attaining its highest development when the shore consists of sand or clay.

Widely distributed in Greenland without known northern or southern limit; the northern limit likely to be found at some place near Smith's Sound.

Abundantly flowering and fruiting.

Hibernates covered by snow and often by ice.

V **77. Carex ursina** DEW.

On moist sand at brackish lagoons at the shore, sometimes in rather extended patches.

Disko: The south coast at Godhavn 69°15′ (E. P.); Maligiaq at the mouth of Diskofjord 69°25′ (Th. Fr.); at the head of Nordfjord various places 69° 50′—55′ (P.); the Waygat-coast Ũnartuarssuk (Nath.); Ivnârssukasik 70°10′ (P.).

Hare Ø (P.).

Mainland: The coast of Nûgssuaq peninsula from Marraq north of the great river down to Atanikerdluk (P.), several localities; Eqe 69°42′ (P.); Claushavn (S. H.); Orpigssuit (Htz.); Egedesminde (Bl.); Itivneq (W. & H.).

A decided northern type, the last mentioned locality being the south limit in West Greenland. North of the area found at Niaqôrnaq 70°47′ (V.) then not till Ellesmereland (Simmons), but no doubt overlooked from the interjacent part of the coast.

Abundantly flowering and fruiting.

Hibernates covered by snow and ice.

Λ **78. Carex gynocrates** WORMSKJ.

Disko: Østerdalen (Nyg.) Blæsedalen (Th. P.). Skarvefjæld at Godhavn 69°17′ (Th. Fr.); Skansen 69°25′ (Rikli).

Mainland: Claushavn 69°5′ (Bg.); Ikamiut 68°37′ (Bl.); Tasiussarssuaq 68°23′ (Bg.).

A decided southern type, rare from all localities (perhaps overlooked)? in Greenland.

The above-mentioned localities represent the north limit; south

of the area also seen but a few times. The record from 81°40′ (BESSELS; ASA GRAY) seems very doubtful, no doubt owing to confusing of the material.

Flowers and fructificates.

79. **Carex alpina** Sw. (*C. Halleri* GUNN.).

On fertile spots in the heath, in bogs, moist herb-mats, thickets and rock-ledges.

Disko: From the south coast; Diskofjord and Mellemfjord and the adjacent valleys, from small creeks between the two fjords; common (P.). From the southern part of the Waygat-coast, but hitherto not observed on the northland and the great valleys here.

Mainland: A continued area from the tract of Holsteinsborg along Disko Bay over the interior gneissic tract of Nûgssuaq peninsula to the inner part of the Nordost-Bugt. Here common everywhere at some distance from the outer coast, and ascending, in localities favourably exposed to the sun, to considerable altitudes.

A southern type, common southwards, but in the mentioned area only from few places, the northmost at 72°22′ (P.).

Abundantly flowering and fruiting.

Hibernates covered by snow.

80. **Carex holostoma** DREJ.

In moist bogs and along lake-shores.

Disko: The south coast at Godhavn 69°15′ and in the valleys here, rather common (Th. Fr.; P.).

Mainland: From Igdluluarssuit 69°50′ down to Tasiussarssuaq 68°28′ observed at many places and no doubt common. Archipelago of Egedesminde: Egedesminde Ø 68°42′ (V.; Bl.; P.); the southern side of Qeqertarssuatsiaq 68°23′ (P. & E.).

The last mentioned locality hitherto the south limit. We searched for it in the southern fjords, but in vain. Northwards recorded from Ũmánaq (V.) and Prøven 72°20′ (Hart.).

No more than NOTØ (Indre og Mellem-Kvænangens Karplanter. Nyt Magazin f. Naturv. 40. 1902 pag. 351), I have seen transition forms between this and the preceding species, and I quite agree with the above author as to their having quite different habitats and modes of living.

Abundantly flowering and fruiting.

Hibernates covered by snow.

81. **Carex rariflora** (WAHLENB.) SM.

Generally in moss-bogs and moist heath, but also on herb-mats with abundant and long-lasting snow-cover; now and then in thickets.

Very common throughout the whole area.

Widely distributed in West Greenland, without southern limit; the northern limit not known, but lying somewhere north of 73°.

Ascends the hills following the continuous vegetation.

Abundantly flowering and fruiting.

Hibernates covered by snow.

V 82. **Carex stans** Drej (*C. aquatilis* var. *stans* Boott.; Ostenfeld).

Character-plant of the *Carex*-bogs, along lake-shores growing in company with *Eriophora*, *Carex pulla*, *C. rotundata*, *C. rigida* var. *concolor* (Cp. Porsild l. c. 167 ff. Fig. 10—11 Resumé 280).

Disko: Very common everywhere, ascending the hills to at least 600 m (P.).

Hare Ø (P.); Mainland: Nûgssuaq peninsula and from Torssukâtak down to the Sydost-Bugt common; evidently somewhat scarcer in the gneiss-domain than in the basalt. Egedesminde (V.); the continent at 68°30′ (P. & E.).

According to Ostenfeld: Fl. Arctica these last localities represent the southern limit of the species here in West Greenland.

Thus it is a northern type; knovn from Ellesmereland and is likely to be found from the interjacent coast north of the Danish settlements.

Often the species is difficult to distinguish from the closely allied *C. rigida*, *C. pulla*, *C. rotundata*.

In addition to the characters already mentioned in the literature we may add the colour of the old sheaths of *C. stans* usually being *light-brown* and *dull*, while that of the other species is more or less purple-coloured and shining.

Abundantly flowering and fruiting.

At the beginning of the winter a decided winter-stander; later on thickly covered by snow.

Λ 83. **Carex subspathacea** Wormskj. (*C. salina* var. Autt.).

On strand-meadows and strand-rocks among other halophilous vegetation; very small and insignificant and no doubt often overlooked. Only exceptionally forming carpets along the brackish lagoons.

Disko: At Godhavn, Udkiggen 69°12′ on splashed strand-rocks (P.); Mellemfjord about 69°45′ (Rikli!); Hare Ø 70°20′ (P.).

Mainland: Kugsinerssuaq 70°15′, forming extensive patches (P.); Augpalârtoq north of Kangâtsiaq (K.); Ikertôq Fjord at Holsteinsborg (V.).

A southern type. The above mentioned localities represent the northern limit, but it is hardly the real one, the plant in East Greenland being found far north of this latitude.

Abundantly flowering and fruiting.
Hibernates covered by snow and ice.

I 84. **Carex rigida** Good. and var. **concolor** R. Br.

The main-species on heath, herb-mats, thickets and in stony soil ascending the hills to considerable altitudes.

The variety: in very moist bogs and especially at lake-shores; generally in the lowland.

Both very common throughout the whole area.

Widely distributed in Greenland with neither southern nor (the main-species) northern limit.

Abundantly flowering and fruiting.

The variety thickly covered by snow and often by ice during winter. The main species certainly snowless now and then.

⊥ 85. **Carex rufina** Drej.

On moist sand, partly inundated during the early part of the summer.

Disko: In a little pool near Godhavn 69°15′ (Th. P.!) very rare.
Mainland: N. Isortoq 67°15′ (V.).

A decided southern type, perhaps often overlooked. The mentioned locality indicates the northern limit. Found a few times in South Greenland.

Flowers and fructificates.

Hibernates covered by snow and ice.

Λ 86. **Carex bicolor** All.

On moist sand along the shores of lakes and rivulets; on barren spots of sand and clay in the heath.

Disko: Several localities at Godhavn 69°15′ (Rikli; Th. P.; P.), at the foot of Ingigsoq at the Waygat 69°45′ (P.).

Mainland: Lerbugt at Claushavn (Bg.); Qeqertarssuatsiaq (the southern side) 68°23′ (P. & E.); Kangerdluarssuk at Agto 67°69′ (E. P.!).

Everywhere very scarce, often only in single tufts.

A decided southern type; scarce (or overlooked) throughout Greenland; south of the area only found a few times, to the north of it found at the interior of Nordost-Bugt 70°32′ (Vh.).

Abundantly flowering and fruiting.

Hibernates covered by snow.

i 87. **Carex scirpoidea** Michx.

In mouldy and peaty soil; in vigorous heath, herb-mats, thickets and rock-ledges.

Very common throughout the whole area.

Widely distributed in Greenland, without southern limit, being observed till 72°20′; the north-limit is not known.

Ascending the hills following the old dense vegetation.

Abundantly flowering and fruiting.

Hibernates covered by snow.

Carex deflexa Horn (*C. piluliferae* var. Autt.).

Recorded from Rode-Bay 69°20′ by Sørensen; probably an error.

A decided southern type, only found a few times in South Greenland chiefly between 60° and 62°; the northmost at 65°25′.

V 88. **Carex rupestris** All.

On dry heath, in stony soil and on rocks.

Very common in the northern part of the area; and in the archipelago of Egedesminde we found it frequently. Recorded from many places in the fjords inland from Holsteinsborg.

A northern type, the distribution of which north of 72°30′ is not well known; (recorded from Ellesmereland, but scarce (Simmons).

The southern limit of its continuous distribution is to be settled in the tract of Holsteinsborg. South hereof recorded quite isolated from Godthaab 64°11′ (Sør.).

Abundantly flowering and fruiting.

Often snowless during winter.

i 89. **Carex supina** Wahlenb.

On vigorous heath, sunny gneiss-slopes and the margin of thickets.

Disko: Diskofjord near Ikineq 69°28′ several times (P.).

Mainland: Numerous localities between Torssukátak and Sydost-Bugt; from here southwards rather common; from the interior of the fjords, thus from many places in N. Strømfjord (P. & E.), becoming frequent southwards.

Widely distributed species, but probably with north-limit somewhere in West Greenland; hitherto known to about 73°.

Abundantly flowering and fruiting.

Surely covered by snow during winter.

i 90. **Carex pedata** Wahlenb.

In similar localities and with a similar distribution, perhaps somewhat scarcer.

Disko: South coast at Godhavn and Mudderbugt (P.); Eqaluit and Nordfjord (Th. Fr.); Ujaragsugssuk at Waygat (Nath.).

Mainland: Sarqaq, Ritenbenk, Påkitsoq (V.); Eqe (P.); Jakobshavn (V.); N. Strømfjord: Ungôriarfik (Korn.); N. Isortoq (V.).

Abundantly flowering and fruiting.

No doubt covered by snow during winter.

V 91. **Carex misandra** R. Br. (*C. fuliginosa* Hook.).

On heath, rocks and fell-field.

Disko, Hare Ø, Mainland north, east and south of Disko Bay ascending the hills to considerable altitudes, very common. Then becoming scarcer. Not recorded by Kruuse and not observed by us in the archipelago of Egedesminde. In N. Strømfjord scarce on the northern coast; from Eqaluarssuit on the south-coast (P. & E.) but not elsewhere; not even on the hills.

N. Isortoq and Holsteinsborg (V.); Maligiaq and Itivneq 66°58′ (P. & E.); Naujarssuit; Qeqertalik Fjord 66°46′ (P. & E.).

A northern type; the last mentioned localities indicates the known south-limit.

Abundantly flowering and fruiting.

Undoubtedly always covered by snow during winter.

V 92. **Carex ustulata** Wahlenb.

A rare (or overlooked) northern type, only found once at the northern limit of the area at Marraq north of the great river on Nûgssuaq peninsula (P.); north hereof only from a few localities.

Abundantly flowering and fruiting.

i 93. **Carex capillaris** L.

In open spots on heath and fell-field and on rocks.

Very insignificant and therefore often overlooked. Not especially noticed in our diaries, but probably common throughout the whole area; always to be found when intentionally searched for.

Widely distributed in Greenland, but perhaps with a north limit somewhere at Melville-Bay. Known from north of 74°, and scarce from Jones Sound (Simmons).

Abundantly flowering and fruiting.

Not always covered by snow in winter.

Λ 94. **Carex microglochin** Wahlenb.

At edges of moist flat rocks, among moss and algal growth; everywhere rare or overlooked.

Disko: Hitherto not found.

Mainland: Imilik at the ice-fjord of Jakobshavn 69°10′ (Th. P.!); Claushavn (Bg.); Lerbugt (Htz.); Orpigssuit (Htz.); N. Strømfjord: Ivnalik 67°44′ (P. & E.). Head of Itivdleq fjord, 66°29′ (P. & E.).

Decidedly a southern type; north of the area found twice; the northmost locality at 70°40′ (V.).

Flowers and fructificates.

Undoubtedly covered by snow during winter.

Λ 95. Carex rotundata Wahlenb.

In marshes especially on lake-shores.

Disko: The south coast, at Godhavn here and there; Mudderbugt (P.).

Mainland: Several places between Sarqaq 70° and Sydost-Bugt, but not common; hitherto not collected or reported from the district of Egedesminde, neither from the archipelago nor from the fjords inland from Holsteinsborg.

A southern type, the known north limit of which is at Ikerasaq 70°35′.

Plant of the lowland.

Abundantly flowering and fruiting.

Hibernates covered by snow and often by ice.

⁝ 96. Carex pulla Good. (*C. saxatilis* L.).

In swampy bogs, at lake-shores often forming extensive patches together with *C. stans*, *C. rotundata*, *C. rigida* var. *Bigelowii* and *Eriophora*.

Disko, Hare Ø, Nûgssuaq peninsula and Mainland around Disko Bay very common (P.). Still more frequent in the north-district of Egedesminde, but then getting scarcer southwards. N. Strømfjord: Sarfarssuaq 67°49′ (P. & E.); S. Kangerdluarssuk (W. & H.); Holsteinsborg (V.).

A northern type, being rare south of the area; according to Ostenfeld known to about 64°. Northward collected rather continuously to 72°45′, and this does not seem to be the north-limit. Mostly a lowland plant.

Abundantly flowering and fruiting.

Hibernates covered by snow and often by ice.

XII. Juncaceae.

Λ 97. Juncus arcticus Willd.

On moist sand and sandy clay at the shores of lakes and rivulets, on open spots in bogs often among halophilous vegetation.

Sometimes in herb-mats and thickets.

Disko: Locally, but from many localities on the south coast, the fjords and from the inner part of the great valleys; scarce on the northland and hitherto not found on the north-east coast.

Hare Ø (P.).

Mainland: Holsteinsborg several places, but not common. From the south-district of Egedesminde rather common. From the archipelago of Egedesminde recorded as "rather common" by KRUUSE; according to our opinion rather scarce.

In the district of Christianshaab and in the tract to the south of that numerous localities. Rare in the district of Jakobshavn; Jakobshavn (V.); Atâ (P.); Eqe (P.); from several places on the Waygat-coast of Nûgssuaq peninsula.

A southern type, north of the area only recorded from the inner part of Nordost-Bugt at Ikerasak; Ũmánaq and at Igdlorssuit on Ubekendt Ejland 71°15′, this place the north limit of the species.

Lowland plant, not ascending to any considerable altitude.

Abundantly flowering and fruiting.

In the first part of the autumn winter-stander; later on covered by snow and often by ice. Never snowless during winter.

⊥ 98. **Juncus bulbosus** L. (*J. supinus* MOENCH).

In loose mire at the borders of shallow ponds, very rare (no doubt often overlooked because of its diminutiveness).

Mainland: District of Christianshaab: Orpigssuit 68°39′ (Htz.); district of Egedesminde: the southern side of Sarqardlît 68°37′ (P. & E.).

A southern type; according to GELERT (Ostenfeld: Fl. Arctica). found besides at 60°55′.

The three localities near the coast, the plants small and quite sterile.

Hibernates enclosed in ice.

Λ 99. **Juncus castaneus** SM.

On moist sand and clay, at the shores of lakes and rivulets, on open spots in bogs, often among halophilous vegetation; rarer among the mosses of bogs and from herb-mats.

Rather common throughout the whole area. From the district of Egedesminde KRUUSE states it as "rare", but this only applies to the outmost islets of the archipelago.

A southern type, north of the area getting scarcer, limited to places far from the outer coast. The known north limit from the interior at Laksefjord 72°20′. Likewise it seems to become rarer southwards; south of 63° only known at the terminal moraine of Frederikshaabs Isblink 62°30′; probably alpine or descended here.

Abundantly flowering and fruiting.

At the beginning of the autumn winterstander; later on thickly covered by snow and often by ice.

i 100. **Juncus triglumis** L.

On moist sand and clay at lake-shores, and on open spots in bogs and heath.

Undoubtedly common throughout the whole area, but often absent from lists of plants owing to overlooking.

Rather a southern type, the north limit of which is not known. To 70°45′ we have specimens and verified records. My previous record from 72°30′ is apparently incorrect (Medd. om Grønld. 50, p. 371), owing to an erroneous determination.

Ascending to 5—600 m.

Abundantly flowering and fruiting.

Hibernates usually abundantly covered by snow and often by ice.

I 101. **Juncus biglumis** L.

On moist sand and clay, often on bare spots in bogs and heath; scarcer among taller mosses and other vegetation.

Very common throughout the whole area. From the archipelago of Egedesminde recorded by KRUUSE as "rare" but that does not agree with our observations.

Ascending the hills to the snow-line; in tracts of dense vegetation often found ascended or on the shady side.

Widely distributed arctic plant without neither southern nor northern limit in Greenland.

Abundantly flowering and fruiting.

Hibernates covered by snow.

Λ 102. **Juncus trifidus** L.

On dry and sunny rock-ledges among other vegetation, sometimes on gravel or in herb-mats; seems to be rarer on basalt than on gneiss and sandstone.

Disko: The south coast, at Godhavn rather common and from Mudderbugt to Ingigsôq 69°45′ (P.).

Mainland: Rode Bay 69°20′? (Sør.). From the archipelago of Egedesminde reported by KRUUSE as "common"; no places are indicated and we have not refound it here. N. Strømfjord: Ivnalik 67°47′ (P. & E.), N. Isortoq 67°20′ (Ros.) and S. Kangerdluarssuk 67°0′ (W. & H.).

Southern type, the above-mentioned localities represent the known north limit.

Lowland plant.

Abundantly flowering, but at Godhavn, for instance, not fruiting every year.

Often snowless; but the living parts of the plant always covered during winter.

⊥ 103. **Juncus bufonius** L.

On moist spots of clay, and especially at the lower edge of bare, flat gneissrocks.

N. Strømfjord from Ipiutarssuaq along the southern side of the branch to Sarfarssuaq 67°45′ observed from several places (P. & E.)

We were highly surprised by finding this plant here, being hitherto only known from paths at the old Norse-ruins at Igaliko (about 61°).

On the map in Medd. om Grønld. 15 tab. XII an old ruin is marked off at Itivdlerssuaq, the passage from Nuerssorfît to Arfersiorfik. According to informations from the natives in the district there really is a big ruin, but no doubt of Eskimoic origin. Thus, according to the absence of Norse-ruins here, it is unlikely that the plant has been introduced by the Norsemen.

The specimens were very small; from simple, only one centimeter heigh, single-flowered specimens, to specimens 3 centimeter heigh, ramified from the ground, these bearing 1—3 flowers.

Normally flowering.

Λ 104. **Luzula parviflora** (Ehrh.) Desf.

In herb-mats and as undergrowth in open copses; on Disko often in the neighbourhood of the hot springs; often forming extensive patches.

Disko: The south coast and the valleys here between Laksebugt and Mudderbugt, about 69°45′ (P.).

Diskofjord, on the north coast and at the hot springs on the south coast (P.).

Eqaluit, 60°30′ (P.); Mellemfjord: the north coast at Kuánit and Ikorfarssuit, 69°45′ (P.).

Mainland: (Strange to say not recorded from the district of Christianshaab). Egedesminde? (Sør.) in vain searched for by us (E. & P.); Augpalârtoq north of Kangâtsiaq, 68°25′ (Kr.); Kangerdluarssuk east of Agto, 67°59′ (E. P.); N. Strømfjord near Gieseckes lake (Korn.); Eqaluarssuit, 67°36′ (P. & E.), (in the interior part of the fjord not observed by us!) N. Isortoq (V.); Holsteinsborg: from several places in the fjords, especially from the interior (W. & H.); (P. & E.).

A southern type, the above-mentioned places representing the north limit in West Greenland, 68°25′ for the mainland, 69°35′ for Disko. Common in South Greenland.

Lowland plant, only ascending to inconsiderable altitudes.

Abundantly flowering and fruiting. When the snow falls in the

autumn the big inflorescences are filled with snow and the thin stalks break; thus not winter-stander. All the habitats are covered by a thick layer of snow during the winter, but favourably exposed as to the melting of the snow in the spring-time. Var. β *sparsifolia* Lange, is a shade-form from the copses.

Λ 105. **Luzula spicata** (L.) Dc.

On heath, herb-mats and copses.

Rather common, though not everywhere, throughout the whole area, usually at some distance from the shore and in fairly favourable places. Kruuse records it from the archipelago of Egedesminde as "very rare"; but this applies only to the small outer islets; in the interior of the greater islands and in the fjords the plant is not rare.

The north limit of the species is not known, but in favourable places the plant is surely to be found till 72°30′; the records from the district of Cape York have proved themselves erroneous determinations.

At Disko-Bay and north hereof usually lowland plant though ascending to 600 m in favourable places.

Abundantly flowering and fruiting.

Winter-stander, the basal shoots being covered by snow during the winter.

I 106. **Luzula confusa** Lindeb. (*L. arcuatae* var. Autt.).

On heath and on fell-field, very common throughout the whole area except in vigorous and dense lowland vegetation. Ascends the hills to the snow-line; also on the Nunataqs above the glaciers of Disko.

Widely distributed arctic plant.

Flowers and fruits abundantly.

Specimens from our area determined by other authors as *L. arcuata* are, in our opinion, not typical.

V 107. **Luzula nivalis** (Laest.) Beurlin.

On Disko, Hare Ø and Nûgssuaq peninsula common on the hills and in deserted places in the lowland. Recorded from numerous places in the gneissic area of Disko-Bay; Kruuse records it from the archipelago of Egedesminde as "very rare" and this is undoubtedly right; still it has been collected at Manermiut (Bg.); Qeqertarssuatsiaq 68°23′ (P. & E.), on the Mainland at 68°30′ (P. & E.); Kangerdluarssuk east of Agto 67°59′ (E. P.). In N. Strømfjord collected by Kornerup, but not re-found by us; in Ikertôq Fjord (V.); Sarfánguaq (V.; P. & E.).

A northern type, the known south limit at about 64°30′.

Usually abundantly flowering and fruiting.

Often snowless during winter.

Λ 108. **Luzula frigida** (Buch.) Samuelsson (*L. multiflora* Autt. non Ehrh.).

In copses, herb-mats and vigorous heath.

Disko: On the south coast; in the fjords and the big valleys rather common in favourable places in the lowland. Not observed on the north and north-east coast.

Mainland: In the gneissic area of Disko-Bay rather common. As to the archipelago of Egedesminde Kruuse states: "rare", but this is only the case on the outmost and small islets; we (P. & E.) found it on the southern side of Sarqardlît 68°39′; on the mainland at 68°30′; Qeqertarssuatsiaq (the southern side) 68°23′; Kangerdluarssuk east of Agto and common in N. Strømfjord and its ramifications. Very common in the district of Holsteinsborg (P. & E,)

Certainly a southern type; north of Disko-Bay from a few places to 72°30′ this temporalily being the north limit of the species.

Usually lowland plant only ascending to inconsiderable altitudes.

Abundantly flowering and fruiting.

Covered by snow during the winter.

NB. The referring of the plants from our area to *L. frigida* instead of to *L. multiflora* is due to Dr. G. Samuelsson who revised the material in H. H.

XIII. Liliaceae.

i 109. **Tofieldia palustris** Huds.

In moss-bogs and moist spots in the heath, sometimes in herb-mats and copses, but not, as stated by Rowlee and Wiegand l. c. p. 423, "on sand along the shore". Very common throughout the whole area.

Widely distributed species, the north limit of which is yet unknown. It has been observed till north of 74°, but the records from north of Cape York wants confirming.

Ascends the hills following the dense growth of vegetation.

Flowers and fruits abundantly.

Covered by snow in winter.

V 110. **Tofieldia coccinea** Rich.

This rare plant, hitherto only known from four places in the Nordost-Bugt (between 70°30′ and 71°45′) and from three places in East Greenland (between 70°30′ and 76°30′), was unexpectedly found by us in the interior of N. Strømfjord from Ipiutarssuaq 67°42′ towards Sarfarssuaq almost everywhere, growing among tall mosses on the very vigorous heath of the lowland; besides in several places on a hill in the narrow passage between the Qarssorsaq-arm of this fjord and Arfersiorfik 67°55′ ascending to 3—500 m.

In spite of the occurence here the species must be settled as a northern type immigrated to Greenland from the North. No doubt

it is more common northward and surely overlooked, being difffcult to distinguish, in sterile state, from the preceding species.

Here abundantly flowering; some of the specimens had a height of 15—20 cm. We also saw old fruitstalks.

In all the places seen by us, the plant was no doubt covered by snow during the winter.

XIV. Orchidaceae.

⊥ 111. **Habenaria hyperborea** (L.) R. Br. (*Limnorchis major* (Lange) Rydb.

In vigorous herb-mats and open copses, especially at the hot springs.

Disko: The south coast at Godhavn found in several places and by several collectors. Diskofjord: Ũnartoq 69°25′ (Krogh!), Kuánersôq 69°33′ (P.) and just opposite Qârusuit 69°32′ (P.).

Mainland: District of Holsteinsborg: Naujarssuit in Qeqertalik-Fjord 66°45′ (P. & E.).

A decided southern type, from hence not known till 64°14′ and according to Rosenvinge not common till south of 63°. The above-mentioned localities thus represent the northern limit on the mainland and Disko.

All the mentioned places are in the lowland.

Abundantly flowering and fruiting.

Covered by snow in winter.

⊥ 112. **Habenaria albida** (L.) R. Br.

In places similar to those of the preceding species and often growing in company with it.

Disko: The south coast near Godhavn 69°15—16′ in several places and collected by several people. Diskofjord just opposite Qârusuit 69°32′ (P.).

Mainland: Imilik at Jakobshavns Isfjord (Sør.), here searched for in vain by us; no doubt a confusion with Imilik in Godthaab-fjord (Sørensen also collected here!). Ikertôq-Fjord 66°50′ (Rink); Qeqertalik 66°45′ (Brummerstedt). South of 65° common, according to Rosenvinge.

A decided southern type; the above-mentioned places represent the north limit; all the places in the lowland.

Flowers and fruits abundantly.

Covered by snow during winter.

⊥ 113. **Listera cordata** (L.) R. Br.

Disko: The south coast, among the herbs within the area of hot springs in Engelskmandens Havn at Godhavn 69°15′; first found by Holbøll, afterwards by numerous collectors.

Diskofjord: Opposite Qârusuit 69°32′ (P.).

A decided southern type, on the mainland from a few places in Godthaab-fjord till 64°30′ and not very common at 60° — 62′ according to ROSENVINGE.

All the mentioned places are in the lowland.

At Godhavn usually not flowering, only during favourable, i. e. damp and moist summers, but then abundantly.

We found unripened fruits in August 1917.

Under a thick cover of snow in the winter.

⊥ 114. **Corallorrhiza trifida** (L.) CHATEL. (*C. innata* R. BR.).

In vigorous herb-mats and near hot springs.

Disko: Engelskmandens Havn 69°15′ (Sør.) 1891, not re-found; in Disko-fjord at Kuánerssuit (Th. Fr.).

A decided southern type. On the mainland known from N. Isortoq 67°15′ (V.); southwards not till Godthaab-fjord.

The above-mentioned specimens from Engelskmandens Havn are flowering.

Covered by snow in winter.

Dicotyledones.

XV. Salicaceae.

i 115. **Salix herbacea** L.

In bogs and moist spots in the heath, among stones in the outlets of springs; very typical for places where the snow-cover lasts long.

Very common throughout the whole area.

Widely distributed in West Greenland without south limit; the north limit is unknown, no doubt to be found north of 76°.

Ascending the hills to considerable altitudes, though not in newly formed mineral soil.

Abundantly flowering and fruiting.

Hibernates covered by a thick layer of snow and often besides by ice.

⊥ 116. **Salix Myrsinites** L. var. **parvifolia** AND.
S. ivigtutiana LUNDSTR., *S. Uva Ursi* PURSH sec. SCHNEIDER.

Recorded from Ritenbenk 69°45′ (V.) and from Jakobshavn 69°13′ (V.).

A decided southern type; not known till 64°48′ in the Godthaabs-fjord; and it is possible that the above-mentioned specimens may prove themselves to be something else, for instance, a hybrid between the other species.

¡ 117. **Salix groenlandica** (And.) Lundstr. (*S. arctica* var. Autt.).

In moist soil. In bogs and moist heath, at water-courses, often in river-deltas washed down from alpine habitats; ascends the hills following the rivers from the glaciers and the snow-fields.

Often pioneer on recently denuded moraine or alluvial soil.

Very common throughout the whole area.

Widely distributed in West Greenland, without south limit; in the extreme north perhaps replaced by other varieties of *S. arctica.*

Under identical conditions this species flowers before the following and is abundantly fruiting.

Normally covered by snow and often by the ice of the springs; perhaps snow-less now and then when growing on the hills.

¡ 118. **Salix glauca** L.

Forming copses in places favourably exposed to the sun, if only abundantly covered by early melting snow, and provided the following summers being warm and damp. Thus often on the sunny side of rocky walls, these lying sheltered from the wind.

Besides it is always present in the heath-vegetation, both in the dry part and in the moist. It is to be found in bogs right down to the lake-shores and is sometimes growing in the most dry and barren places, dunes, gravel among boulders and stones, on rock-ledges and in crevices.

Very frequently used as fuel by the natives. The bushes are pulled up in the summer and stacked to dry for the winter.

Very common throughout the whole area.

Widely distributed in West Greenland without southern limit. The north-limit is not known, but undoubtedly to be searched for north of 76°.

Abundantly flowering and fruiting, except in the most barren places.

In many places snowless. But to the copses the snow-cover is absolutely necessary. The long shoots, projecting above the snow, are usually dying, the copses thus resembling clipped hedges.

Nevertheless the copse- and espalier-willow is able to stand the night-frost, even when the buds and shoots are denuded of snow, if only the growth of these have not yet begun.

The willows of Greenland are much varying, especially *S. glauca* and *S. groenlandica.* A great part of the variations are directly dependent on the quality of habitat, and various parts of the same specimen often have various forms of leaves. But besides these variations there

often occur others which are not due to the ecological conditions; and they seem to be hereditable constant.

In every copse of considerable extension several forms occur, now forming small groups, now growing scattered in the copse.

I have only mentioned above the main-species and none of the numerous varieties described and named by previous authors, because I am well aware of my deficiency of ability and my lack of information and also of my shortage of figures and of properly determined material for comparison.

The various highly interesting papers on Arctic Willows by C. K. Schneider (Botan. Gazette 66—67) came to my knowledge after having handed in my MS. to the printer, and consequently I have not been able to utilize them here.

XVI. Betulaceae.

! 119. **Betula nana** L.

On heath and not too moist bogs. Usually one of the most important plants of the heath and in places it becomes dominant and plainly forms "birch-heath". Besides forming espaliers against boulders. Less frequently forming small birch-copses sheltered by willow-copses.

In places, which are warm in summer and sufficiently covered by snow during the winter and especially in valleys far from the coast, it is able to rise from the ground with the branches above the other plants of the heath; this is the case as well at 72° n. l. as south at 67°.

Very common throughout the whole area, though not everywhere. As well at the southern as in the northern part of the area, for instance, on Disko and Nûgssuaq peninsula, one may sometimes walk for miles without seing a single specimen of *Betula*.

It cannot be the climatic conditions which causes this scarcity. I should rather think the lack of the commensals necessary for the roots was the reason for this.

The larger specimens are collected on a large scale by the natives who use them for fuel.

Widely distributed in Greenland; the south limit at 63° (Ros.). The northern limit unknown, but to be searched for north of 74°30′.

Abundantly flowering and fruiting.

Hibernates normally covered by snow, but in unfavourable places the snow-cover periodically may be absent.

⊥ 120. **Alnus Alnobetula** (EHRH.) HART. var. **repens** (WORMSKJ.) WINKL. (*A. viridis* var. *A. ovata* var.).

Recorded from Ikertôq-Fjord 66°45′ (V.), but not re-found.

A southern type known in West Greenland from 61° to 66°.

XVII. Polygonaceae.

I 121. **Oxyria digyna** (L.) HILL.

On fell-field in moist places often in the melting-water from the snow-fields. In the lowland at water-courses, in herb-mats and among stones on the talus.

Very common throughout the whole area. Widely distributed in Greenland with neither northern nor southern limit.

Abundantly flowering and fruiting.

To be sure normally covered by snow during winter.

Λ 122. **Rumex Acetosella** L.

In rather dry gravelly soil, on heath and in crevices. Few and scattered occurrences, but, when occurring, usually in great quantities.

Disko: Recorded from Godhavn 69°15′ by HART, but during many years searched for in vain. On the other hand, European specimens of the species occur, rather commonly, as introduced weeds. This form is easily distinguished from the Greenlandic, for instance, by the decumbency; European ruderal plants in Greenland are usually decumbent, quick-growing and cannot survive hibernation.

Perhaps the specimen found by HART, belonged to this form.

The north limit of the Greenlandic form lies in the inner part of Nordost-Bugten (from a few places (V.)). Rather continuous it occurs along the coasts of Disko-Bay from Atâ 69°45′ (P.) down to Sydost-Bugten; here the habitats lie close together. Westward to Egedesminde, but in the archipelago neither seen by KRUUSE nor by us; in N. Strømfjord and its branchings common (P. & E.). —

From the district of Holsteinsborg recorded from Ikertôq-Fjord (V.); Maligiaq 66°58′ (P. & E.).

A southern type; south of the area to be found here and there, and south of 61°30′ common (ROSENVINGE).

Flowers and fruits abundantly.

Probably covered by snow during winter.

Polygonum islandicum MEISN. (*P. aviculare* L. var. *boreale* LANGE).

Occasionally observed at the settlements throughout the whole area; by us only seen at Qeqertaq 1914, about 70° (P. & E.).

Here it conveyed the impression of an introduced weed, it was flowering, but hardly fructificating before the arrival of the winter. On the

other hand it was absent here in 1918 (E. P.). This seems really to be the fact, too, in most of the other places; it may not yet be acclimated, and thus it cannot be counted among the real Greenlandic plants.

I 123. **Polygonum viviparum** L.

In all sorts of soil, in heath, herb-slopes, copses and fell-field, on sand and gravel and very often in manured soil.

Very common throughout the whole area.

Widely distributed in Greenland, with neither northern nor southern limit; ascending from the shore to considerable altitudes.

Abundantly flowering and forming bulblets in great quantities. In rich soil fruits are developed lately in good summers.

Most of the habitats are covered by snow during winter.

i 124. **Koenigia islandica** L.

Most frequently found in and by running water, in shallow places in brooks, among small stones at the borders of brooks and lakes (pools); in manured drains at inhabited places often forming extensive patches; also to be found in moist places on the heath and in moss-bogs.

Widely distributed in West Greenland without south limit; the northern limit unknown, but to be settled north of 73°.

Flowers and fructificates abundantly.

Its habitats are covered during the winter, usually by ice.

XVIII. Caryophyllaceae.

Sagina. The specimens of this genus are usually neglected by the collectors (also by us) because of their diminutiveness, and thus I have nothing of importance to add to the hitherto known facts of its distribution.

Λ 125. **Sagina saginoides** (L.) Dalle Torre (*S. Linnaei* Presl).

Disko: The south coast, Lyngmarken 69°15′ (Bg.).
Mainland: N. Isortoq 67°15′ (Ros.).

A southern type, the above mentioned habitats the only ones reported from our area and temporarily the north most in Greenland. No doubt rare.

Abundantly flowering and fruiting.

! 126. **Sagina intermedia** Fenzl (*S. nivalis* Fr. p. p.).

In sandy and clayey spots on heath and fell-field, often at the seashore, but also as an inland-plant, ascending the hills.

Round Disko-Bay collected and noticed by numerous collectors from many places; no doubt common. Not expressly recorded from the districts of Egedesminde and Holsteinsborg, perhaps here somewhat rarer.

Widely ranging in Greenland with neither northern nor southern limit.

Flowers and fruits abundantly.

To be sure often snowless during winter.

i 127. **Sagina caespitosa** (J. VAHL) LANGE. (*S. nivalis* FR. p. p.) (*S. Pumilio* R. BR. SIMM).

In places similar to those of the preceding one, perhaps a little dryer.

Collected and noticed by many collectors in the sourroundings of Disko-Bay, to be sure rather common here. Just as *S. intermedia* not recorded expressly from the districts of Egedesminde and Holsteinsborg, but no doubt occurring here also.

Widely distributed, without south-limit; the northern limit to be searched for at Melville-Bay, north of 74°15′.

Abundantly flowering and fruiting.

No doubt often snowless during winter.

i 128. **Honkenya peploides** (L.) EHRH. (*Halianthus*, *Ammodenia*, *Arenaria*, AUTT.) var. **diffusa** HORN.

On sandy sea-shores often forming extensive patches.

Common throughout the whole area; the distribution often interrupted owing to the absence of sandy localities.

Widely distributed in West Greenland, without southern limit. The north limit unknown, but likely to be settled near Smith's Sound.

Abundantly flowering and fruiting.

Covered by snow during winter.

V 129. **Arenaria ciliata** L. subsp. **norvegica** (GUNN.) FRIES. (cfr. OSTENFELD & DAHL: Nyt Mag. f. Nat. 55. 1917.

On moist sand, on the hills often in melting-water from the snowfields, in the lowland washed down by the brooks. In moist places in newly formed moraine.

Disko: Rather frequent occurrences on the northland near the coast as well as on the hills away from the sea (P.). Rare on the south coast: at Røde Elv, 69°16′; at Kûgssuaq-River near Skansen 69°20′; at Mudderbugten 69°42′ (P.).

From Hare Ø and the interior of Nûgssuaq peninsula and the coasts of Waygat, rather common (P.).

Mainland: Near the inland-ice 68°45′ (Engell!).

A northern type; the above-mentioned places represent the southern limit in Greenland.

Flowers and fruits abundantly.

The lowland-localities are, at any rate, covered by ice or snow during winter.

¡ 130. **Minuartia biflora** (L.) Schinz & Thell.
(*Alsine biflora* Wahl, *Arenaria sajanensis* Willd. Fern.

In moist spots on heath, herb-mats and fell-field, on fresh moraine or among grass and other vegetation. Common throughout the whole area.

Widely distributed in West Greenland without southern limit; according to Rosenvinge rarer in the southern part of the land probably alpine.

The north-limit unknown; to be searched for north of 74°30′. Ascending from the coast to the limit of vegetation.

Abundantly flowering and fruiting.

Hibernates covered by snow.

I 131. **Minuartia verna** (L.) Hiern. (incl. *Alsine rubella* Wahl.

In similar places, occurs intermingled with all sorts of vegetations.

Very common throughout the whole area.

Widely ranging in Greenland with neither northern nor southern limit, from the coast ascending to the limit of vegetation.

Flowers and fructificates abundantly.

No doubt often snowless.

Λ 132. **Minuartia verna** (L.) var. **propinqua** (Rich.) Lange.
(an = *Alsine hirta* Wormskj.)

I do not know this variety sufficiently so as to form an independent opinion of it.

The distribution is very characteristic: In West Greenland from relatively few places, all far from the outer-coast. From 60° up to Disko-Bay; the northmost places: Christianshaab 68°45′ (Htz.), Diskofjord: Evqitsoq 69°30′ (P.), and from Mellemfjord 69°40′ (P.). On the east coast of Greenland: 66°18′ to 71°48′ according to Kruuse.

By later authors, e. g. by Fernald and Ostenfeld considered identical with the var. *hirta* Wormskj. which is common throughout our area.

Thus it seems to be a southern and western type in North America descending into the temperate area. (Cfr. Robinson & Fernald: Gray Manual 7th edition p. 381).

V 133. **Minuartia stricta** (Sw.) HIERN.

Seems to be rare or overlooked. Only found a few times in the northern part of the area:

Disko: Qutdligssat, about 70° (Th. Fr.). Kûgaq (P.). Evqitsoq (P.). Laksebugt (P.).

Mainland: Nûgssuaq (P.). Lerbugten about 69° (Bg.) and Sarpiussaq 68°35′ (Bg.), this is the south limit of the species. In addition known from a few places on the north coast of Nûgssuaq peninsula near Ũmànaq.

A northern type, also very rare in Iceland and northern Scandinavia

Flowers and fructificates.

Λ 133 a. **Minuartia groenlandica** (RETZ.) OSTENF.

Recorded from Egedesminde by SØRENSEN. Afterwards searched for here and in many other places, but in vain. Within the area only once found at Holsteinsborg (Mrs. DEICHMANN).

A decided southern type.

⊥ 134. **Stellaria media** (L.) WITH.

Very common throughout the whole area, usually as a garden-weed or in manured places, favourably exposed to the sun, just in the neighbourhood of the gardens, and here it manages to exist for several years.

It is never growing far from the gardens and when these are abandoned for a series of years, it becomes undoubtedly extinct. The occurence in the cultivated gardens is no doubt due to impurity of the garden seeds used, these being of various provenience and very variable. Some of the forms are thus annual, especially in cultures under glass-roof.

We found it indigenous, far from present and former human dwellings, at the base of the fowling cliff Naujarssuit in Qeqertalik-Fjord 66°44′ (P. & E.), here growing among tall vegetation of genuine Greenlandic plants; here perennial.

A decided southern type, expressly recorded indigenous it was found by HARTZ at 61°45′.

Abundantly flowering and fruiting as well in the above-mentioned place as in the gardens.

Hibernates abundantly covered by snow.

I 135. **Stellaria humifusa** ROTTB.

At the sea-shore, as well on sand and clay as on rocks among other shore-plants; also in manured places in the neighbourhood of the shore. Sometimes forming extensive patches.

Very common throughout the whole area.

Widely distributed in Greenland without southern, and probably also without northern limit.

Flowers and fructificates abundantly.

Hibernates covered by snow and often by ice.

⊥ 136. **Stellaria borealis** Big. (*St. alpestris* Hartm. *St. calycantha* Ledeb.).

In vigorous herb-slopes and copses.

Disko: Only at the hot springs on the south coast near Godhavn and in the great valleys in the inland; from many places in Diskofjord (P.), in Mellemfjord at Kuánit and Ikorfarssuit 69°44′ (P.); Mudderbugt (P.).

Mainland: Recorded from Egedesminde by Sørensen, but in vain searched for by us both here and in a great many much more favourable places (P. & E.). Found in Ikertôq-Fjord 67°50′ (Rink.; Korn.).

A decided southern type; the above-mentioned places on Disko represent the northern limit; not common till south of 61°30′ (Ros.).

Abundantly flowering and fruiting.

Hibernates covered by snow, often by ice.

I 137. **Stellaria longipes** Goldie. (Incl. *St. Edwarsii* Hook.

In almost all sorts of soil, right from the sand and dunes of the sea-shore, the settlements, the manured soil of the fowling-cliffs and -islets and to the heath- and rock-vegetation, ascending to the fell-field near the inland-ice.

Often forming extensive patches and conquering places where the grass is peeled off: building sites, garden plots and the like. In the gardens it becomes a troublesome and ineradicable weed.

Very common throughout the whole area.

Widely diffused in Greenland with neither northern nor southern limit.

Abundantly flowering, but very seldom fruiting.

Only in unfavourable places not covered by snow in winter.

Λ 138. **Cerastium cerastioides** (L.) Britt. (*C. trigynum* Vill.).

On moist clay- and sand-spots on the heath and very often as a pioneer on newly-formed moraine; in bogs and at the springs.

Disko: Common on the southern part of the island and in the two southmost fjords and the valleys there. Along the west coast rarer. On the Waygat-coast rare, only on the southern part.

Hare Ø (P.).

Mainland: From Waygat down the Disko-Bay-coast in spots, not as common as on Disko. Rather rare in the archipelago of Egedesminde, Qeqertarssuatsiaq 68°23′ (P. & E.), not noticed by us in any locality in N. Strømfjord, but no doubt to be found on the hills in suitable places.

A southern type, the northmost habitat on Nûgssuaq peninsula 70°40′ (P.). South of 64° common, but especially attached to the outer land (Ros.).

From the shore ascending to at least 800 m.

Flowers lately and fructificates but scarcely.

Covered by snow during winter.

⊥ 139. **Cerastium arvense** L.

S. Kangerdluarssuk 67°5′ (W. & H.) among *Salix* and *Archangelica*.

Decided southern type, found only once in Greenland.

I 140. **Cerastium alpinum** L.

As *Stellaria longipes* in all sorts of soil, and just as widely distributed as that species.

Varies infinitely as to size, the length of the internodes, pubescence, form and size of the leaves, the form and construction of tuft, the position of the shoots erect or decumbent.

No doubt most of these forms are ecological, perhaps some of them hereditable, but this can only be settled by experiments in cultivation. In manured soil round the new buildings it occurs in great quantities, especially the form *procerum* Lange, among grasses, these finally overshading and choking it.

Abundantly flowering and fruiting.

On the hills very often snowless during winter.

I have found it with expanded flowers (hibernated!!) in April (a month before it was flowering in the lowland) on the top of a Nunataq from the interior of Disko, ascended to 1300 m.

V 141. **Melandrium apetalum** (L.) FENZL. (incl. **f. arctica** TH. FR. Öfv. K. Sv. Vet. Ak. Förh. 1869 p. 133).

On sand gravel, clay, bare spots on poor heath on newly formed moraine and at the borders of brooks from the inland-ice.

Disko: The northland to Nordfjord; on the eastern side to about 69°50′ and in the valleys common. (P.). On the south coast not seen, not even ascended.

Hare Ø: (Nath.; P.).

Mainland: On the coast of Nûgssuaq peninsula common down to 70°, thereafter only at Eqe near the inland-ice 69°42′ (P.) and Claushavn 69°5′ (R. Br.).

A decided northern type; the above-mentioned places represent the hitherto known south limit.

Ascends the hills to the snow-line.

Abundantly flowering and fruiting.

No doubt normally hibernating snow-covered.

V 142. **Melandrium affine** J. Vahl.

On sand, gravel, clayey banks, fell-field and in bare spots on the heath, on rocks, often in manured soil.

Disko: Everywhere very common (P.).

Hare Ø (P.).

Mainland: Nûgssuaq peninsula and the land east of Disko-Bay, common. By Kruuse recorded "very rare" in the archipelago of Egedesminde; this does not agree with our observations. In N. Strømfjord common, especially on the southern side, as well as on the hills (P. & E.); likewise common in the fjords inland from Holsteinsborg (P. & E.).

A northern type, south of the area only observed a few times. The southern limit at 65°38′.

Flowers and fruits abundantly.

Hibernating snowless, at any rate in alpine places.

V 143. **Melandrium triflorum** (R. Br.) J. Vahl.

In places similar to those of preceeding one and with the same distribution, but generally rarer, but often locally better developed than *affine*. Seems to prefer manured soil to a greater extent than the preceding one, and here it becomes tall and vigorous.

In the field often very difficult to distinguish from *affine*, though always more glandular-hairy than that species. On vigorous specimens the glandular-hair can be developed to such a degree that the plants are densely covered by adhering sand and dust.

But in the seeds we have a never failing character of distinction (Cfr. Lange and Abromeit).

As the preceding, a northern type and almost with the same southern limit, about 65°40′.

I 144. **Silene acaulis** L.

In almost all sorts of soil: sand, gravel, open spots in the heath and bogs, in crevices and shelves. In quick-sand it often forms spots more than one meter in diameter.

Very common throughout the whole area.

Widely distributed in Greenland with neither northern nor southern limit; from the sea-shore to the snowline.

Abundantly flowering and fruiting.

Often snowless during winter.

Λ 145. **Viscaria alpina** (L.) Don.

Disko: The south coast and the adjacent valleys; here and there, a great many habitats known, but not common (P.).

The north coast of Mellemfjord 69°45′ rare (P.).

Mainland: Kingigtoq 70°10′ (Htz.); Ritenbenk (Bg.); Atâ 68° 45′(P.); at the head of Pâkitsoq-Fjord (Bg.; P.); (not seen at Eqe (P.)); Jakobshavn (W. & H.); round the Sydostbugt from several places; Egedesminde (P.); Qeqertarssuatsiaq 68°23′ (P. & E.), the mainland at 68°30′ (P. & E.); Kangerdluarssuk east of Agto (E. P.); common in N. Strømfjord. From the last place southward rather common, especially at some distance from the coast.

A southern type. North of the area only observed a few times, the northmost at about 72°30′.

In lime-charged soil the colour of the flower is a very intense red; a white-flowered variety has been observed at Egedesminde.

Flowers and in good seasons some of the fruits are ripened; seedlings are found.

Covered by snow during winter.

XIX. Portulacaceae.

Λ 146. **Montia lamprosperma** Cham.

In moist places, for instance, periodically inundated lake-shores, moist spots between bog-mosses and heath-plants; in manured places near the houses.

The distribution insufficiently known; often overlooked because of its diminutiveness.

Disko: The south coast, from several places; no doubt common.

Mainland: From Ritenbenk down to the Sydostbugt collected from several places; no doubt common.

From the archipelago of Egedesminde recorded as "rare" by Kruuse. In N. Strømfjord at Eqaluarssuit 67°36′ (P. & E.); Holsteinsborg (V.).

To be sure a southern type. The northmost localities hitherto known are in the Nordostbugt at about 70°40′ (Vh.).

Abundantly flowering and fruiting.

The habitats are covered by snow and often by ice.

XX. Ranunculaceae.

Λ 147. **Ranunculus paucistamineus** Tausch. var. **eradicatus** Laest. Gelert (*Batrachium confervoides* Fr.).

In pools and the shallow parts of lakes. Common round Disko-Bay and together with *Hippuris* the most frequent aquatic plant. There are fewer statements from the southern part of the area, but no doubt common here as well.

A southern type without southern limit in Greenland; north of the area only twice observed: 70°28′ (Vh.) and 70°25′ (P.).

Usually abundantly flowering, but during cold summers and in great lakes, in which the winter-ice does not thaw till far into the summer, the flowering may fail to take place. Fructificates when flowering.

f. **terrestris.**

In moist soil among tall *Carices*, at the border of a little lake in Blæsedalen 69°17′ Disko, in which the above mentioned normal Greenlandic forms occurs, a terrestrical form was observed with finely dissected leaves, sections linear, and rather rigid and considerably shorter than those of the normal form. Was just flowering Aug. 1913 (Th. P.!).

⊥ 148. **Ranunculus divaricatus** Schrank. New to Greenland! (Conf. Gelert: Bot. Tidsskr. 19 p. 27 f. *pygmaea*).

A rather deviating form was observed in a pond in the great valley from the head of Nordfjorden about 69°55′. The stalks and submerged leaves deep reddish brown, not fresh green-coloured as in the preceding.

With numerous floating leaves, varying from 3—4 lobed with lobed sections, gradually to pluridivided with linear sections. The underside subpubescent. Submerging leaves capillary, not or only slightly collapsing when withdrawn from the water.

With some hesitation I have classified this plant under the name given above, as the form of the leaves sheaths and the floral parts refer it to *R. divaricatus*, the flowers were somewhat larger and more showy than in the preceding. This variety was heretofore not recorded from Greenland neither from any arctic country.

The plant was growing very vigorously. In some parts of the pond the surface of the water was quite covered by the floating-leaves and fair white flowers (Th. P. & P.).

Both species hibernate under and enclosed in ice.

T 149. **Ranunculus affinis** R. Br. Simmons: Ellesm. p. 101.

Only once observed within the limits of the area at Arssalik, 67°30′ (Korn.). Another time collected in S. Strømfjord a little south of our area (Jens.). These occurrences are quite isolated and outside the extension of the species.

High-arctic type, otherwise known from North- and East Greenland.

⊥ 150. **Ranunculus acer** L.

In berb-mats and copses.

Præstefjældet at Holsteinborg 66°55′ (W. & H.).

A decided southern type with northern limit here.

Besides known from Godthaabs-Fjord and common in the southmost part of Greenland (Ros.).

Flowers and fructificates.

Hibernates covered by snow.

! 151. **Ranunculus pygmaeus** Wahlenbg.

In moist moss, among pebbles at the borders of brooks, in the melting-water from the snow-fields, in moist places on the heath; very often in outlets from manured places near the settlements.

Very common throughout the whole area, though in the fjords of the southern part generally ascended. In the northern part ascending to the limit of vegetation.

Widely distributed in Greenland without north-limit, on the west, coast continually down to about 64°; south hereof known only from a few, generally high-alpine, habitats.

Abundantly flowering and fruiting.

Hibernates covered by snow and often by ice.

V 152. **Ranunculus nivalis** L.

In moss-bogs, moist spots in the heath and moraine, in fell-field.

Disko: Very common on the northland; rather common on the southland and in the fjords (P.).

Hare Ø, common (P.).

Mainland: Common on Nûgssuaq peninsula and the land east of Disko-Bay. Very scarce in the district of Egedesminde, as well in the archipelago as on the land beyond. N. Strømfjord about 68° (Korn. Not seen by us); Holsteinsborg 66°50′ (W. & H.).

A northern type, the last mentioned places represent the southern limit.

From the coast ascending to the snow-fields and the inland-ice.

Flowers and fructificates abundantly.

Hibernates covered by snow.

V 153. **Ranunculus sulphurus** Sol. (*R. altaicus* Laxm.).

In places similar to those of the preceding one and almost with the same distribution in the area, but somewhat rarer.

Disko: Rather common on the northland and ascended; on the south coast till 69°15′ rarer, but known from many places rigth down to the sea-shore (P.).

Hare Ø (P.).

Mainland: Common within the basaltic part of Nûgssuaq peninsula; hitherto not observed south of Torssukátak about 70°, neither by previous collectors nor by us; but no doubt it may be found here. Recorded by Sørensen from Hunde

Ejland and Manermiut 68°35'; in vain searched for in these places by KRUUSE and us.

A northern type, the above-mentioned places represent the southern limit.

Abundantly flowering and fruiting.

Hibernates covered by snow.

! 154. **Ranunculus hyperboreus** ROTTB.

In moist places, for instance, in moss at the springs, in small pools, often in manured soil.

f. fluitans! (Syn. *R. aquatilis* var. *arcticus* Durand Pl. Kan. No. 1. Appendix to E. K. KANE: Arctic Explorations The Second Grinnell Exp. in search of Sir John Franklin 1853, 54°55', Philadelphia 1856 vol. II).

In small sheltered and manured pools at the settlements a luxuriant form occurs with lengthened petioles, and floating leaves of extraordinary size. Most frequently the whole surface is covered by them. —

Most frequently quite sterile, but sometimes flowering at the margins of the patches as the water gradually dries up.

I do not doubt of the identity of the plant collected by KANE and determined by DURAND, with the above mentioned variety, though the flowers are recorded white. The petals of various Ranunculus-species, especially those of *R. hyperboreus* and *nivalis*, often become white during the drying, especially when the specimens are laid in the press in wet condition.

Disko: Very common, from the coast ascending to considerable altitudes.

Hare Ø (P.).

Mainland: Nûgssuaq peninsula and the land east of Disko-Bay, common. Rather common in the archipelago of Egedesminde; scarce, alpine or absent in the fjords. Thus we found it common at Taseralik at the mouth of N. Strømfjord, but absent in the inner part, not even ascended. Also known from several places near Holsteinsborg.

Widely distributed in Greenland, without northern limit.

Also known right down to southmost Greenland, but scarce and seems here limited to the outer islets (Ros.).

With the exception of the water-form commonly flowering and fruiting.

Hibernates covered by snow and often by ice.

Λ 155. **Ranunculus lapponicus** L.

In moist moss-bogs in the lowland favourably exposed to the sun during the summer.

Common throughout the whole area though often absent or locally scarce, for instance, the coast-region of N. W. Disko, but occurring in great quantities in the great valleys at the head of Nordfjord. — North of the area common inland from the outer-coast at least to the fjords at 72°32′; here it occurs in such quantities that the north limit must lie farther northwards (P.). South of the area still common in the fjords inland from Holsteinsborg (P. & E.). But south hereof only once observed at 65°, and a few times in the southern part of the Godthaabs-Fjord at about 64°8′.

Not known from East Greenland (nor from Iceland)!

(Compare with this its interesting distribution in Fenno-Scandinavia: A. HEINTZE Bot. Not. 1914, p. 181 ff.).

Flowers late in the summer and is usually setting fruit even at the northmost habitats. The fruit-stalks project above the first snow-cover.

All the stalks and roots are deeply buried in moss, only the leaves and flowers projecting above the surface.

Abundantly covered by snow during winter.

Λ **156. Ranunculus reptans** L.

In shallow pools; in the creeks of lakes, here often among *Carices*.

Throughout the whole area rare or overlooked.

Disko: South coast near Godhavn, 69°15′, several localities (Th. P. E. P.) Mudderbugt, 69°35′ (P.).

Mainland: Marraq north of Nûssaq 70°30′ (P.). Atanikerdluk 70°5′ (Nath.); Naujat about 70° (Htz.); Pâkitsoq Fjord (Bg.; P.); Jakobshavn (Sør.); Claushavn (Bg.); Orpigssuit (Htz.); Tasiussarssuaq (Bg.; Bl.); not recorded from Egedesminde nor from Holsteinsborg, but no doubt overlooked.

A southern type. North of the area only found on Qaratsap Nunatâ 70°30′ (Vh.).

All the mentioned places in the lowland.

Sparingly flowering, but fructificates though not every year nor in all places.

Λ **157. Thalictrum alpinum** L.

In herb-mats and copses.

Disko: Rather common on the south coast and in the adjacent valleys. Diskofjord: rather common on the north side, on the southern side only at the hot springs. Mellemfjord: on the north side, but rare (P.).

Hare Ø: on the south-coast (P.).

Mainland: Nûgssuaq 70°40′ (P.); Ritenbenk and the surroundings hereof 69°40′ (several collectors); Jakobshavn (Bg.); from the Sydost-Bugt and southwards rather common at some distance from the coast (P. & E.). Common south of 64° (Ros.).

A southern type; only found once north of the area on Ũmánáq Storø 70°40′ (Vh.).

Within the area only a lowland plant.
Abundantly flowering and fruiting.
Hibernates abundantly covered by snow.

⊥ 158. **Anemone Richardsonii** Hook.

In copses.

(Disko: On the printed labels of J. Vahl recorded from 69°14′, the latitude of Godhavn. The specimen does not exist and now the plant is absent here. The record may be due to a slip of memory on the part of Vahl, but it is also possible that the plant has locally become extinct afterwards. The locality Lyngmarken, from which the most of the rare plants originate, has suffered very much from willow-felling and thus many southern plants have undoubtedly been eradicated.)

Mainland: S. Kangerdluarssuk 67°5′ (Jens.); from various places near Holsteinsborg 66°55′ (several collectors); Naujarssuit in Qeqertalik Fjord 66°45′ (P. & E.).

A decided southern type; with the exception of the Holsteinsborg district only known from a few places in S. Isortoq 65°20′—40′.
Abundantly flowering and fruiting.
Hibernates abundantly covered by snow.

⊥ 159. **Coptis trifolia** Salisb.

In herb-mats, willow-copses and vigorous heath.

Very rare, only in the southmost part of the area. S. Kangerdluarssuk (W. & H.); N. Isortoq (Ros.); N. Strømfjord at 67°32′ (Sør.); Kangerdluarssuk east of Agto 67°58′ (E. P.).

A decided southern type; the last mentioned place represents the north limit. According to Rosenvinge common south of 64°. All the northern localities are in the lowland.

Our specimens were sterile, and I have also got sterile specimens from Godthaabs-Fjord, probably it only flowers during favourable summers at its north limit.

Hibernates under a thick layer of snow.

XXI. Papaveraceae.

! 160. **Papaver radicatum** Rottb.

In barren gravelly places, new moraine and fell-field, in dried-up river-beds and deltas; less common on open heath or among grass and other plants in manured soil. Common throughout the whole area, in the northern part from the coast to the snow-line, in the southern part preferably in the highland.

Widely distributed in West-Greenland, rather a northern type, on the west coast becoming scarce south of 64°, and on the east coast it seems to be very rare south of 69°.

Note: *P. radicatum* no doubt includes several small species as already indicated by SIMMONS and others. The white-flowered variety is common far into the north, but very rare, already in our area. On account of its occurence in patches and for other reasons, too, it seems to be hereditary constant.

Flowers and fruits abundantly. Many fruits are devoured before ripening by birds, for instance ptarmigans and snow-buntings.

Hibernates often snowless.

XXII. Cruciferae.

I 161. **Cardamine bellidifolia** L. (*C. sinuata* (VAHL) ROWLEE & WIEGAND).

On moist sand and clay, in fell-field and new moraine; bare spots on the heath, rarer among grasses in manured soil.

Throughout the whole area from the coast to the snow-line, but from relatively few places; undoubtedly not because of being rare, but only overlooked.

Widely distributed in Greenland although rather a northern type; in the southmost part of Greenland only exceptionally from the lowland (Ros.).

Abundantly flowering and fruiting.

Undoubtedly covered by snow during the winter.

I 162. **Cardamine pratensis** L. var. **angustifolia** Hook.

In moist moss-bogs, at the borders of small lakes often partly submerse; sometimes in shallow brooks.

Distributed through the whole area, most frequent in the southern part, but nowhere common. Now and then occurring in small patches.

Widely ranging in Greenland without southern limit; and no doubt without northern limit, too, being found far north into Ellesmereland. The scattered occurrence is no doubt due to the fact that the plant does not fruit anywhere in Greenland, but disperses itself only in vegetative manner, by deciduous leaflets.

Usually flowering, though hardly in unfavourable places.

The flowering is specially dependent on the time of the melting of the snow.

Normally the flower is pure white. On limecharged soil it becomes lilac, almost as the European form.

Hibernates covered by snow and often by ice.

Λ 163. **Arabis alpina** L. (Incl. *A. glabra* A. Bl. Rowlee & Wiegand).

From the herb-mats, copses, springs, water-courses and moss-bogs of the lowland ascending to the fell-field and moist edges of moraines. Very common throughout the whole area.

A southern type; the known north limit now lying at about 72°30′. Nevertheless in South Greenland more frequent in the coast region than in the fertile part of the interior.

Abundantly flowering and fruiting.

Hibernates covered by snow.

Λ 164. **Arabis Holboelli** Horn. (*Turritis retrofracta* (Hook.).

On sunny, not too dry slopes.

Disko: The south coast near Godhavn 69°15′ from several places (several collectors, for instance, Holbøll); Mellemfjord 69°42′ (Th. Fr.).

Mainland: Tasiussarssuaq (Bg.; Bl.); Christianshaab (Sør.); Jakobshavn (Holbøll); Sarqaq about 70° (V.). Common in the region of Holsteinsborg; especially in the Fjords.

South of the area rather common till 64°, but south of this latitude only a single specimen is known from about 61° (Ros.).

In spite of this it must be stated as a decided southern type according to its occurrence in America.

Abundantly flowering and fruiting.

Certainly always covered by snow during winter.

! 165. **Arabis Hookeri** Lange (*Turritis mollis* Hook.).

In favourably situated and rather moist places. Rare and local.

Disko: Without locality recorded by Vafl; not re-found.

Mainland: Eqe 69°42′ near the glacier (P.); N. Strømfjord: Amitsuarssuk (Korn.?); Sánerut (Korn.); N. Isortoq (V.); the fjords inland from Holsteinsborg: numerous places (several collectors).

A northern type; south of the area only observed in a few places, the southmost at about 64°. North of the area extraordinary many localities in the southmost part of Nordost-Bugt. Besides known from the district of Cape York.

Abundantly flowering and fruiting

! 166. **Arabis arenicula** (RICH.) GIL. (*Sisymbrium humifusum* J. VAHL. *Parryae* sp., *Eutremae* sp. AUTT.).

On new moraine, gravelly and sandy fell-field and most commonly found in river-deltas, washed down from the hills.

Disko: The northland: the coast and the great valleys; from Qutdligssat to Nordfjord, being rather common here (P.); N. Laxebugt on the west coast and Kuánerssuit in Diskofjord (Th. Fr.).

Mainland: The great valley and the Waygat-coast of Nûgssuaq peninsula rather common (P.); south hereof rare: Eqe 69°42′ near the glacier (P.); Pâkitsoq about 69°30′ (V.).

A northern type; south of the mentioned places only seen a few times either alpine or washed down from the highland, but found right down to the south point of the land.

Abundantly flowering and fruiting.

To be sure often snowless during winter.

⊥ 167. **Nasturtium palustre** (L.) R. BR.

Found once at the river of S. Strømfjord, about 67° (Jens.) and once at about 61°.

A decided southern type.

⊥ 168. **Braya humilis** (C. A. MEY.) ROBINSON (*Sisymbrium h.* C. A. MEY.).

On lime-charged soil and raised marine clay.

From a few places at the head of S. Strømfjord (Jens.). Portage between Itivdleq and S. Strømfjord about 66°30′ (P. & E.), here in great quantities and locally the most characteristic plant. Here decidedly perennial and not hapaxanthic as recorded by LEDEBOUR. Cfr. LANGE Consp. II, p. 252).

A southern type, in Greenland only known from the mentioned places, but in America to be found right down into the temperate area.

Flowers and fruits abundantly.

Undoubtedly hibernating under snow.

V 169. **Braya purpurascens** (R. BR.) BUNGE; *Platypetalum* R. BR.

On new moraine, sandy and gravelly fell-field, from here often washed down and to be found in the river-deltas. Often growing in company with *Arabis arenicula.*

Disko: The north-east coast from Asuk to Kûgánguaq (Th. Fr.; P.), and from the valleys beyond the coast (P.). Diskofjord: at the great glacier north of the inmost branch at Kuánerssuit about 69°40′ (P.).

Mainland: The great valley of Nûgssuaq peninsula, rather common (P.); the Waygat-coast from several places (several collectors); Ritenbenk, 69°42′ (V.).

A decided northern type; the-above-mentioned localities represent the south-limit of the species.

Abundantly flowering and fruiting.

No doubt often snowless during winter.

I 170. **Cochlearia officinalis** L.

In Bih. t. K. S. Vet. Ak. Handl. Bd. 26, Afd. III, No. 1, p. 34 G. Andersson and H. Hesselman have published a few short diagnoses and figures by the late O. Gelert of the forms of *Cochlearia* as far as they vere known at his time from arctic regions. Hence it is usually easy to refer a specimen to one of the three forms acknowledged by Gelert:

β. **groenlandica** (L.) Gel.

γ. **oblongifolia** (D. C.) Gel.

δ. **arctica** (Schlecht.) Gel.

But as Gelert did not succeed in completing the revision before his death, and as he unfortunately did not leave any list of synonyms of the forms known from Greenland, a satisfactory distribution cannot yet be given.

Cochlearia officinalis is growing near the shore, often among other plants and in manured soil.

Very common throughout the whole area.

Abundantly flowering and fruiting.

Hibernates covered by snow and ice-foot.

Λ 171. **Draba incana** L.

In herb-mats.

Disko: Only observed once at Narssaq at Waygat 69°50′ (P.).

Mainland: From the vicinitiy of Disko-Bay, very rare: Sarqaq about 70° (V.): Tasiussarssuaq (Bg.; Bl.) and southwards perhaps less rare; nevertheless we did not find it in the fjords of the Egedesminde district. In the southmost part of Greenland very common (Rosenvinge).

A decided southern type, the mentioned places represent the north limit in Greenland.

Recorded from about 79° by Wetherill, but I should consider this a confusion with *Dr. arctica* (Cfr. Porsild: Medd. om Grld. 47, p. 244).

Within the area a lowland plant.

In the flora the plant is usually given as biennial; but in "Flora v. Deutschland und Fennoskandinavien sowie von Island und Spitzbergen" F. Hermann very correctly remarks that new rosettes often

appear in the axils of the old rosettes, the plant in this way being perennial.

This is the case with the plant from Greenland (Julianehaab, Qaqortoq leg. C. Petersen; Arsuk leg. Lindhard; Qeqertalik at Holsteinborg leg. Porsild), but I have also seen it on specimens from the Alps with inflorescences from the preceding year (Scarl., leg. BRAUN-BLANQUET) and from Scandinavia (Visby, leg. K. JOHANSSON).

Other specimens from Greenland and elsewhere do not flower till after a strenghtening of several years. Specimens flowering in the second year I have seen from the southmost part of Greenland (Pamiagdluk, leg. E. Lundholm) and this was also the case with plants cultivated here on Disko from seeds brought from Rigi-Scheidegg in the Alps. (Cfr. also ELISABETH EKMAN, Arkiv f. Bot. 12. No. 7, p. 15).

To be sure covered by snow during the winter.

Λ 172. **Draba aurea** M. VAHL.

On spots favourably exposed to the sun, sandy and gravelly slopes.

Disko: Very rare; Diskofjord: Ikineq 69°25′ (P.) and Kuánerssuit 69°35′ (P.).

Mainland: Rare at Disko-Bay: Sarqaq about 70° (V.); Jakobshavn (V.); in surroundings of Sydost-Bugten several places, Sofiehavn (Bl.); Simiutarssuaq in the district of Egedesminde (K.); N. Strømfjord, several places (P. & E.), for instance, at the tenting-place Ugssuit it was characteristic of clayey-gravelly slopes. Becoming more frequent southwards; common in the fjords inland from Holsteinsborg (P. & E.).

A southern type, the mentioned places represent the north-limit Abundantly flovering, the seeds are often only partially developed. Hibernates covered by snow.

V 173. **Draba alpina** L.

On new moraine, in open spots on heath and generally to be found in waste tracts.

Disko: The northland especially along Waygat, rather common (P.); in the southland rare, most frequently washed or blown down from the hills.

Diskofjord: Kuánerssuit 69°35′ (P.); Maligiaq (Sør.); from several places near Godhavn (P.).

Hare Ø (Nath.; P.).

Mainland. Rather common from the coast and interior of Nûgssuaq peninsula (P.); from several places near Torssukátak. South of the ice-fjord of Jakobshavn very rare: Lerbugten about 69° (Bg.); Akúnâq about 68°40′ (Sør.); Simiutarssuaq about 68°10′ (K.).

A northern type, the above mentioned places represent the south limit of its continual distribution. Quite isolated it has been found on Jensen's Nunataq 62°50′ at an altitude of 1250 m.

Around Disko-Bay also to be found in the lowland.
Abundantly flowering and fruiting.
Undoubtedly snowless now and then during the winter.

i 174. **Draba crassifolia** GRAH.

This insignificant species is undoubtedly often overlooked, thus the distribution insufficiantly known.

Disko: At Godhavn in the lowland as well as on the hills; observed several times.

Hare Ø (P.).

Mainland: Sarqaq (V.); Kangâtsiaq (Sør.); Ikertôq Fjord ca. 66°45′ (V.).

South of the area found at 64°40′, north of it till ca. 73°. From East Greenland also known from places on the middle of the coast. Nevertheless I am inclined to consider it a northern type, and it is no doubt to be found far northwards.

LANGE Conspectus p. 38 writes: "annual or biennial hardly perennial". Specimens from Godhavn are plainly perennial.

In sound condition the petals are pale yellow; I have never seen white flowers (Cfr. E. Ekman l. c. p. 13).

Flowers and fructificates.

No doubt normally covered by snow during the winter.

I 175. **Draba nivalis** LILJEBL.

On rocks, rarer on gravel. Very common throughout the whole area.

Widely ranging in Greenland without northern or southern limit. From the shore to the snowline.

Abundantly flowering and fruiting.

Hibernates, often snowless.

V 176. **Draba fladnizensis** WULF (Incl. *Dr. lapponica* WAHL, *Dr. Wahlenbergii* HARTM.).

In all sorts of soil: sand, clay, gravel, rocks, among grasses a. s. o. Very common throughout the whole area.

Widely ranging in West Greenland, but a northern type without north limit, but with a southern limit of continual distribution at about 64°; south hereof only observed once.

Ascends the hills to the snowline.

Abundantly flowering and fruiting.

Often snowless during winter.

T 177. **Draba subcapitata** Simm.

This very small species of the high north has not been known with certainty till after the investigation by Simmons (Ellesmereland, p. 87 ff.); it has been found a few times at the north limit of the area.

Disko: The north-east coast a little north of Kûgánguaq 70°10′ (P.).
Mainland: From the mouth of the great river of Nûgssuaq and southward several places 70°20′—25′ (P.); in these places growing on very barren rocks of trap-breccie.

The mentioned places represent the southern limit of the species in Greenland.

Flowers and fruits abundantly.

No doubt snowless during winter.

! 178. **Draba hirta** L. (Incl. *Dr. rupestris* R. Br.).

In all sorts of soil from the most barren fell-field and rocks to vigorous heath, herb-mats, copses and grass-fields of the lowland; often in manured soil.

Very common throughout the whole area.

Widely ranging in West Greenland, but particularly a northern type. The continous distribution stops at about 64° according to Rosenvinge; south hereof very rare, no doubt alpine.

Varies very much, most of the varieties being of ecological nature.

Very abundantly flowering and fruiting.

Often snowless during winter.

V 179. **Draba arctica** J. Vahl (? *Dr. magellanica* Lam. Ekman: Nomenclature of some North-European Drabae. Ark. f. Bot. 12. No. 7 1912 p. 2).

In places similar to those of the preceding species.

Disko: Hare Ø and the Mainland down to the ice-fjord of Jakobshavn, common but not in the same degree as the foregoing. South of the ice-fjord rather scarce: at 68°30′ (P. & E.); Kangerdluarssuk at Agto 67°55′ (E. P.); N. Strømfjord, Ungôriarfik (Korn.), not seen by us anywhere in the fjord; From the neighbourhood of Holsteinsborg and the adjacent fjords recorded by many collecteors.

A northern type, having its southern limit of continual distribution in West Greenland at ca. 67°, but occurs isolated at 64°10′.

I cannot accept the opinion expressed by Simmons and other authors, that *Dr. arctica* is to be considered a variety of *Dr. hirta*. I willingly admit the difficulty of referring certain specimens to one of the species, but judging by their occurrence in nature I have the decided impression that they are different; and the most important mark: the pubescence is hereditably constant.

Abundantly flowering and fruiting.
Often snowless during winter.

V 180. **Lesquerella arctica** (Wormskj.) Watson.

On sand, especially in the domain of the carboniferous formations, on gravel, dry moraine and river-deltas.

Disko: Coast of Waygat down to 69°50′ and Kûgánguaq-valley, common (P.).
Mainland: Nûgssuaq peninsula: the coast of Waygat and the interior part of the great valley, common (P.); south of Torssukátak only found a few times: north of Ritenbenk (Sylow); Svarte Vogelbay (Htz.); Eqe 69°42′ (P.); Lerbugten about 69° (Bg.).

A decided northern type; the mentioned places represent the south limit in West Greenland.
Abundantly flowering and fruiting.
Perhaps snowless now and then during winter.

XXIII. Crassulaceae.

Λ 181. **Rhodiola rosea** L.

On sunny rocks especially near the shore, on sand and gravel; also to be found inland far from the sea.

It is very difficult to account for the distribution of this species here at the north limit because of some records, which seem to have appeared through a slip of the memory or changing of labels. An old record by Kane exist from Upernivik; the species has not been refound here, but as Kane's plant-lists contain many mistakes, evidently owing to confusion of material from North- and South Greenland, we need not pay any attention to this record. Later on Th. Holm records the plant from Prøven 72°23′, Skarvefjæld and Asungasungâq near Godhavn. None of these specimens exist in H. H., and in vain I have searched for the plant in all the places through many years. —

As a matter of fact the natives do not know the plant from Godhavn, and as *Rhodiola* is a highly valued article of food it certainly belongs to the plants known by the natives.

On the mainland common from Holsteinsborg to the southern part of the district of Egedesminde.

Kruuse states the northern limit here at Kangâtsiaq 68°11′; we have only seen it south of this place (P. & E.). Isolated found at Akugdlît 69°43′ (Engell) and at Jakobshavn 69°13′ (Sør.) (in vain searched for, P.); from several places in Sydostbugten and from Nûk at Christianshaab 68°50′ recorded by the natives.

A southern type.
Flowers and fruits abundantly.
Hibernates undoubtedly covered by snow.

Λ 182. **Sedum villosum** L.

On warm, not too dry rocky slopes, favourably exposed to the sun.

Disko: From several places near Godhavn (several coll.) Diskofjord: Kuánerssuit 69°35′ (P.); no doubt often overlooked on the south-land.

Mainland: Rather common in the domain of Holsteinsborg and the inner parts of the land north hereof to Sydostbugten. North of the ice-fjord of Jakobshavn known from Jakobshavn 69°13′ and Pâkitsoq 69°30′ (V.; P.).

A southern type, north of the area only once found at Qarajaq 70°30 (Vh.).

Abundantly flowering and fruiting; besides abundantly vegetative propagation.

Hibernates under a thick cover of snow and often of spring-ice.

XXIV. Saxifragaceae.

I 183. **Saxifraga oppostifolia** L.

On highland-moraines down to the shore, occurring as well in barren places: gravel and open clayey flats, as among other plants when not overshaded by these. Thus it often grows among grasses, and in this case it flowers before the grass begins to sprout.

Very common throughout the whole area.

Widely ranging in Greenland without southern or northern limit; in the southern part, however, less prominent and usually alpine.

Flowers and fructificates abundantly.

Often snowless during winter.

Not much variable. The formes *pulvinata* and *reptans* described by Andersson and Hesselmann (Bih. K. S. Vet. Ak. Handl. B. 26, Afd. III, Nr. 1, 1900, p. 25, fig. 10—12) are very common. The last, as remarked by the authors, usually in places inundated during the spring-time. Also very commonly found on gravelly banks of brooks.

Λ 184. **Saxifraga Aizoon** (L.) Jacq.

On sunny rocks and slopes, open spots in the heath and among grasses.

Disko: Rather common on the south-land and in the fjords, not observed on the north- and Waygat coast (P.).

Mainland: From the inner gneiss-domain north of Torssukátak and down to the Jakobshavn icefjord in several places, though not common. South of the ice-

fjord rather common. In the inner part of Egedesminde district rather common; occurs but sparingly in the archipelago. In N. Strømfjord and the sourroundings of Holsteinsborg common (P. & E.).

Widely distributed in West Greenland (more scarce in East Greenland), without southern limit; the northern limit not yet known, but to be searched north of 74°30′. Only few habitats known to the north of the area.

In the northern part of the area mainly in the lowland and only ascending some two hundred meters.

Abundantly flowering and ordinarily also fruiting.

Without doubt sometimes snowless during the winter.

Not much varying; the forms *v. brevifolia* Engl. and β. *robusta* Engl., are only ecological.

I 185. **Saxifraga aizoides** L.

On spots with longlasting snow, amongst mosses, sometimes on clay and fresh morainic soil.

Disko: Rare, only collected in a few places on the north-land and here particularly away from the coast (P.).

Mainland: In the great valley and at Atâ on the west coast of Nûgssuaq peninsula, and a few places south of Atâ; but scarce (P.). Between Torssukátak and the Sydostbugt from several places; Eqe (P.); Atâ (A. P. Olsen!); Pâkitsoq (V.); Ilordleq (Bg.; P.); Jakobshavn (V.); Nunatap tasia (Engell!); Lerbugt (Htz.). Also south of Disko Bay scarce: Egedesminde Ø (Lundager!); Alángorssuaq at Igíniarfik (K.); N. Strømfjord, Eqaluarssuit (P. & E,). In the district of Holsteinsborg known from the colony itself (Holb.) and Qeqertalik (Brummerstedt).

Widely ranging in Greenland without southern limit; northwards at least to 78°. Always scarce when occurring.

In most of the places not flowering till late in the summer, hence the fructification usually fails. When sterile, very easily overlooked because of its diminutiveness and occurrence in mosses.

Hibernates covered by snow.

I 186. **Saxifraga groenlandica** L. (*S. decipiens* Ehrh.),

In every kind of soil, dry as well as moist, on rocks and in friable soil, in deserted places and among other plants, now and then in manured soil. Very common throughout the whole area.

Widely distributed in Greenland without northern or southern limit. Ascending to the limit of vegetation.

Flowers and fructificates abundantly.

Often snowless during winter. Varying very much, most of the varieties described seem to be mere ecological forms.

I 187. **Saxifraga nivalis** L.

In bogs, herb-mats, on rocks and fell-field; best developed in sunny crevices with abundant moisture.

Common throughout the whole area, but nowhere occurring in great quantities.

Widely ranging in Greenland without northern or southern limit. Ascends to considerable altitudes.

Abundantly flowering and fruiting.

Hardly snowless during winter.

Varies according to the quality of the habitat from the smallest dwarf-forms to robust gigantic specimens.

Λ 188. **Saxifraga stellaris** L.

To this species I only reckon the so-called mainspecies: *S. stellaris* α characterized by richly ramified inflorescences, abundant flowering and fructification, large rosette-leaves and low stems, whilst the following species has a rich development of bulblets in the inflorescence, narrower and firmer leaves and higher stems. In 1910 I collected plants of *S. stellaris* near Godthaab (64°11′) and cultivated them on South Disko, where this species does not occur. They flower and fructificate every year and keep the normal aspect of the vegetative parts, without forming any transitions to *S. comosa.*

Linsbauer (Oesterr. Bot. Zeit. 63, 1913; not seen, abstract in Bot. Centralbl. 126, p. 313) has cultivated bulblets of *S. comosa* and developed flowering specimens. From the abstract it cannot be seen whether they also were *S. comosa*, what I suppose, as flowering, in my opinion, does not mark a transition to *S. stellaris.* Young and feeble specimens of *S. comosa* will often show one or a few flowers without any bulblets at all, whilst older and more vigorous specimens develop bulblets abundantly, with or without development of flowers.

S. stellaris seems to be absent in America, whilst *S. comosa* is widely distributed in Arctic America.

Lindmark (Bidrag till kännedomen om de svenska Saxifraga-arters yttre byggnad och individbildning. Bih. K. Sc. Vet. Ak. Handl. 28, Afd. III, Nr. 2, 1902) figures, in pl. II figs. 4 and 5, seeds from specimens from northern Sweden and states their size to be 0,6 mm. In the figure the seed-coat is covered by rather long and coarse seriated papillae (»seriatim tuberculata« Lange). Seeds from dried specimens from Valders, Norway, showed the same appearance« The seeds of *S. comosa* from Greenland were somewhat larger, 0,7—0,8 mm, the papillae were lower, their rows denser, their appearance intended to be

granulated rather than tuberculated. — For this investigation I had, however, only a scanty material at my disposal.

S. stellaris grows in luxuriant herb-mats and moss bogs and is common in Southern Greenland up to 65° (Ros.). In our area it is recorded from Manîtsoq, 68°45′ and Ikamiut, 68°30′ by Berlin. I have not seen the specimens, and therefore I cannot ascertain, whether they merely were flowering individuals of the subsequent species or not. We have searched for *S. stellaris* in the southernmost part of our area, but mostly in vain; only once, at Ivnalik in N. Strømfjord, 67°50′, did we find specimens of the true *S. stellaris*, not yet flowering Aug. 6. 1918.

A distinct southern type, the above mentioned places are the northern limit in West Greenland.

V 189. **Saxifraga comosa** (Retz.) Britton (*Spathularia foliolosa* (R. Br.) Small.

In moist moss on bogs and heathland sometimes in manured soil and in moist places in alpine situations.

Very common throughout the whole area, but less prominent and preferably alpine in the southern part. Hence considered a northern type.

Widely distributed in West Greenland without northern limit, decreasing southwards though found right to 62°. Not known from the southern part of the east coast, where *S. stellaris*, according to Kruuse, occurs at least to 67°.

In favourably exposed places flowering and also fruiting (see remarks to the preceding species); besides producing bulblets in abundance. In unfavourable places the flowers fail to appear at all.

Hibernates covered by snow.

I 190. **Saxifraga rivularis** L.

In wet places, moist moss, at the borders of brooks and lakes and often in manured soil; from the brackish lagoons at the shore ascending to the melting edges of the snow-fields.

Very common throughout the whole area.

Widely distributed in Greenland without southern or northern limit.

Hibernates covered by snow and very often by ice.

Varies very much according to the quality of the habitat. Most of the forms are coloured red by anthocyane; but among the various forms there is one with green leaves and white flowers almost without anthocyane-formation. The occurrence of this form does not seem to be dependent upon the habitat, judging by the wanting transition-forms when growing among the red forms; and apparently it seems to be hereditary constant. (Comp. Porsild: Medd. om Grld. 50, p. 377).

I 191. **Saxifraga cernua** L.

In not too dry soil, in bogs, heath, herbmats and copses, very often in manured soil, rarely in fell-fields.

Very common throughout the whole area.

Widely distributed in Greenland without northern or southern limit, though more scarce on the southern part of the West coast being here defeated in the competition with dense vegetation (Ros.).

From the shore ascending to the snow-fields.

In luxuriant habitats flowering abundantly. Ripe fruits were never described, only Lindmark records unripe capsules filled with ovules. A very productive dispersal is effected by means of the small dark-red bulblets on the stem.

As a rule covered by snow in winter.

V 192. **Saxifraga tricuspidata** Rottb.

On rocks and coarse gravel, sometimes in dry heath or fell-field.

Very common throughout the whole area.

A northern type, in West Greenland common to ca. 64° without northern limit. Ascends from the shore to the limit of snowless land, occurring even on the Nunataq's above widely extended snow-fields.

Abundantly flowering and fruiting except in extremely unfavourable places. I have never seen yellow tints in the corolla, only white ones with orange-coloured spots.

Usually snowless during winter. Not much varying; in the shade, for instance in crevices, lengthened green forms occur, the plant, as a rule having an intense red colour; they are usually sterile. Often forming extensive patches.

XXV. Rosaseae.

Λ 193. **Sibbaldia procumbens** L.

In herb-mats and on the edge of willow-copses.

Disko: Very common on the south coast and in the valleys here and in Disko-fjord; rather common on the northern side of Mellemfjord. Here and there on the west coast and in the valleys here up to ca. 70°10′ (P.); not observed in the great valleys of the Nordfjord nor at the hot springs on the Waygat-coast.

Mainland: In the southern part of the area in the district of Holsteinsborg rather common; also found northwards, but not continuously. Thus it is common along the coast and rather common in the southern part of the archipelago of Egedesminde (with exception of the small barren outside-islets). On the contrary, rare in N. Strømfjord, where it is has been recorded by Kornerup; found by us in a single place: on the north coast opposite Eqaluarssuit. In the sourroundings of the Sydostbugt and along the east coast of Disko-Bay up to Torssukátak, rather common, but decreasing in frequency northwards. North of Torssukátak only known from Sarqaq (V.); Majorqarssuatsiaq (Bg.); Hare Ø (P.); and the settlement Nûgssuaq (P.).

A southern type; north of our area only once found at the south coast of Svartenhuk at ca. 71°42′ (P.), the northern limit in West Greenland.

Abundantly flowering and fruiting.

Hibernates covered by snow.

⊥ 194. **Potentilla (Comarum) palustris** (L.) Scop.

In smal, shallow pools.

A decided southern type, only observed a few times in the southmost part of the area: Præstefjæld at Holsteinsborg 66°55′ (W. & H.; P. & E.); Sarfarssuaq 67°50′ (P. & E.).

At the beginning of August our specimens from Holsteinsborg had even just become free from ice and would hardly be able to flower that year. But the specimens from N. Strømfjord were flowering abundantly, but we cannot say whether they were able to fructificate or not, and we did not find old fruits[1]. The plants were forming extensive patches totally filling the pool; in another pool just in the neighbourhood *Menyanthes*, equally rare in Greenland, predominated.

The specimens collected by us belonged to *f. typica* Gunnarsson, subf. *subglabra* Gunnarsson: Bot. Nat. 1914 p. 218—219.

The above mentioned places represent the northern limit of the species in Greenland; south of the area from various places right down to the southmost of Greenland, but everywhere rare.

Hibernates under and in ice.

Λ 195. **Potentilla (Sibbaldiopsis) tridentata** Sol.

In sandy and poor heath and on rocks.

Disko: Recorded from Godhavn (Lyngmarken) by R. Brown and Hart, but, according to Simmons, the specimens belong to *Sibbaldia*. Also by Meehan. In vain searched for by us during many years. — Behind Skansen 69°25′ (P.) on tertiary sandstones.

Mainland: Atâ about 69°45′ (Th. P.!); from several places near Jakobshavn Icefjord (P.). Pâkitsoq fjord 69°28′ in several places (Bg.; P.) From Jakobshavn icefjord southwards more frequent, but always far from the coast. In N. Strømfjord and south hereof common.

A southern type. The above mentioned places represent the northern limit of the species. In South Greenland sometimes ascending to 6—700 m.

Flovers abundantly, but develops hardly any fruits in the northern parts of its range.

Undoubtedly sometimes snowless during winter.

[1] In H. H. I have only seen unripe fruits on one specimen from the southmost Greenland.

196. **Potentilla (Argentina) anserina** L. coll.

The opinions, as to the systematical value of the Greenlandic forms of this collective species, vary very much. Here I follow the classification given by the last monographer of the genus TH. WOLF (Monographie der Gattung Potentilla 1908).

I. Folia subtus dense pilis longis adpressis tomentum verum obtegentibus argenteo-sericea, nitentia, sepala externe plerumque 3 — plurifida, raro integra.

Here a series of varieties, for instance, var. *vulgaris* HAYNE.

II. Folia aut subtus glaberrima, aut tomento vero niveo obtecta, non nitentia vel super nervos pilis brevibus sericeis micantia (prævalente semper tomento opaco); sepala externa fere semper integerrima, rarissime 2- aut 3-fida.

A. Folia et sepala subtus tomentosa, reliquæ plantæ partes aut modice pilosæ, aut glabræ.

1. Planta robusta, foliis maximis usque 30 cm et ultra longis, multijugis; tomentum foliorum intermixtis pilis sericeis brevibus micans.

var. *grandis* LEHM.
New Foundland, ? Greenland.

2. Planta mediocris vel parva, foliis 3—6 (—10) cm longis, 3—5 (—7) jugis, foliolis superioribus 1—2 cm longis, tomentum foliorum omnino opacum, ad summum quandoque secus nervos pilis sericeis paucis submicans.

var. *groenlandica* SER.
West Greenland to ca. 67°.

B. Folia et sepala utrinque glaberrima sicut plerumque reliquæ plantæ partes.

var. *Egedii* WORMSKJ.
(= *Argentina Egedii* RYDB).
West Greenland to ca. 71° N. Lat.

Of the forms accepted by TH. WOLF we have, as far as I can see, the following:

1) var. **vulgaris** HAYNE (variable, may be divided into several subvarieties and forms). Not arctic, though occurring in South Greenland (if identical with *P. anserina* var. *communis* (LEHM) LANGE.

2) var. **grandis** LEHM. North-east Asia, North America, especially the western part, but also New Foundland and (? Greenland.
3) var. **groenlandica** SER. Arctic- and subarctic Europe, Asia especially the North-East, America, Greenland.
4) var. **Egedii** WORMSKJ. With the same distribution as the preceding, but in Greenland farther northwards.

Having no access, however, to WOLF's work here, but only to extracts from it, and as LANGE and later authors give another classification, I am only able to sketch incompletely the distribution of the forms in our area.

1) Var. *vulgaris* has never been seen by us nor reported from our area.
2) Var. *grandis* has been reported twice: from Sánerut in N. Strømfjord 67°40′ (Korn.) and from an islet in Sydost Bugt, 68°35′ (Htz.) By ROBINSON & FERNALD (GRAY's Manual 7th edition this form is merely considered a luxuriant state (of var. *vulgaris*?) in rich meadows. We have several times found large, luxuriant forms in rich manured soil, for instance, on an islet near Akúnâq, 68°35′, Isuamiut, 68°42′ and Ugssuit at the head of N. Strømfjord, 67°50′, but we do not doubt that they were only overmanured specimens of var. *Egedii* growing close by.
Λ 3) Of var. *groenlandica* SER. I have seen vigorous specimens, collected by OSTENFELD at Eqaluit, Ameralik-fjord, 64°10′. They were determined by KOLDERUP ROSENVINGE to the main-species, but the felt is dull and not covered by silky hairs. Similar specimens I possess from the island Ssolowetsk in the White Sea, collected by POHLE[1]); and in our area we collected them at Itivneq near Holsteinsborg, 66°58′.
Λ 4) Var. *Egedii* WORMSKJ. is declared by ROBINSON & FERNALD, (l. c.) to be a dwarf state, common on exposed rocks, whereas P. A. RYDBERG, the American monographer of the genus, keeps it as a distinct species (*Argentina Egedii* (Wormskj.) Rydb. It is the form best known to us.

Var. *Egedii* (WORMSKJ.) occurs only near the shore, as well on sandy or clayey as on rocky ground with scanty covering of earth, but, as a rule, only as high up the cliffs as they are periodically wetted by the surf.

Disko: Numerous localities are known, especially on the southern, western and northern coasts and in the fjords (P.).

Hare Ø (P.).

Mainland: from Marraq at the outflow of the big river on Nûgssuaq peninsula, 70°30′ southwards, occurring in numerous localities, but nowhere common.

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[1]) from the same place and by the same collector I have specimens of var. *vulgaris* with silky hairs over the felt.

A southern type, north of our area only once observed at 70°40′. The range southwards not known to us, as in the records it was ordinarily incorporated with var. *groenlandica.*

Flowers normally, and fruits are developed in favourable places. Besides locally dispersed by the widely creeping stolons.

During winter covered by thick layers of snow and ice, but is uncovered in the early spring by the action of the sea.

We are mostly inclined to follow Rydberg in keeping *Egedii* as a distinct variety or subspecies as we have not found intermediate forms. We only saw the leaves quite glabrous or with few silky hairs, not with a dull felt. In proportion to the small size of the plant the stolons are relatively longer than in var. *groenlandica.*

V 197. **Potentilla pulchella** R. Br.

On the shore or near it, as well in sandy as in clayey soil, in open morainic and alluvial soil but probably only in the neighbourhood of the shore. Sometimes on or under fowling-cliffs, on the resting places of birds and near fox-traps.

Disko: The north-land from Qutdligssat ca. 70° to the mouth of the Nordfjord, not infrequent (P.).

Hare Ø (Nath.; P.).

Mainland: Nûgssuaq peninsula from the mouth of the big river along the Waygat-coast, not infrequent (P.). The east coast of Disko-Bay, from several places, but scarce. Kangâtsiaq 68°15′ in the archipelago of Egedesminde (K.). Near Holsteinsborg 66°56′ (Lundager!).

A decided northern type, the last mentioned places the known southern limit of the species.

Abundantly flowering and fruiting.

Varies according to the quality of the habitat. Thus var. *elatior* Lange is a luxuriant form from manured soil, as already stated by Simmons.

V 198. **Potentilla nivea** L.

Most frequently in stony soil, in fissures and on rock-shelves, but also in open gravelly places in the heath, rarer in manured soil.

Very common throughout the whole area. Widely ranging in Greenland without northern limit; a northern type, its continuous distribution stopping at 64° on a high-alpine locality; only once observed south hereof.

Within the area ascending to the snow-limit.

Often snowless during winter.

Varying very much, the varieties and forms often difficult to classify.

In the determination of my material I have employed the following arrangement extracted from the monograph of Th. Wolf, with a few omissions and still fewer additions, the last in [ ].

I. Folia fere semper ternata, crenata vel serrata ad tertiam, saltem non ultra dimidiam laminae partem incisa, dentibus latis, saepe remotis, plerumque obtusis; plantae super tomentum plerumque parce pilosae, nunquam dense villosae.

A. Foliola 1—2 (3) cm longa, late ovata vel subrhomboidea, basi non vel breviter cuneata, circumserrata, fere aeque lata ac longa vel parum longiora; caules tenues erecti vel adscendentes, 5—20, raro usque ad 35 cm alti.

a. Foliola subtus tomentosa: Var. **vulgaris** (Ch. & Schl.) Lehm. rare in Greenland.

b. Foliola laxe et tenuissime canescenti-tomentosa, subviridia. Var. **pallidior** Sw. (= *subviridis* Lehm.) A shade form of the preceding?

B. Foliola 2—5 cm longa, irregulariter et grosse sinuato-crenata dentibus magnis latis obtusis, quandoque margine subrevolutis, nervis rubescentibus; caules sat crassi, compressi, 20—30 cm longi, prostrati, floribus apice glomerato-cymosis.

Var. **prostrata** (Rottb.) Lehm.

A form from shadowed and manured soil of the following?

II. Folia radicalia plerumque ternata intermixtis interdum quinatis. Foliola 8—15 [35] cm longa, intermedio quandoque petiolulato, ultra dimidiam partem laminae aut fere ad nervum medium usque pinnatifida, segmentis sublinearibus aut oblongis acutiusculis, plerumque approximatis; plantae quandoque + dense sericeo-villosae.

A. Folia longiuscule petiolata, foliola oblonga, dente supremo prominulo, utrinque segmentis 3—7 subpectinatim dispositis; caules 20—30 cm longi, graciles, 2—5 flori, floribus 10—15 mm latis, plantae plerumque laxe pilis longis subvillosae. Var. **pinnatifida** Lehm. (= *subquinata* Lange. Rydb.) Very common in Greenland.

B. Folia parva brevissima petiolata, foliola fere triangulari-cuneata vel rhomboideo-obovata, dente supremo vix prominente, segmentis angustis utrinque subflabellatim dispositis; caules 3—5 cm longi, firmi, subscapiformes 1—2 flori, floribus 18—20 mm latis; plantae dense caespitosae vel pulvinares, pilis longioribus ± dense villosae.

Var. **uniflora** (LEDEB.) TH. W. (= *arctica* (CH. & SCHL.) LGE. = *P. subq.* var. *Pedersenii* RYDB.)
A common dwarf form of the preceding.

1. Var. **vulgaris** CHAM. & SCHL. (an = *vulgaris* LEHM. LANGE: Conspectus p. 8).

   In Greenland much rarer than var. *pinnatifida*. Ordinarily the plants are slender, — rather like specimens from the Alps, — but we have also from luxuriant localities, for instance, Engelskmandens Havn on South Disko, seen vigorous, stout forms. If identical with the var. α of LANGE it should be widely distributed in West Greenland. We have only a few specimens from South Disko and Diskofjord.
2. Var. **pallidior** SW. (= γ *subviridis* LEHM., LANGE l. c. p. 9) is probably a shade form of the preceding, occurring in copses or among tall grasses.
3. Var. **prostrata** ROTTB. As to this doubtful and rarely collected form, OSTENFELD (Medd. om Grl. 43, p. 27) has made the suggestion that it might be a luxuriant form of var. *pinnatifida* from manured soil; to this opinion we can subscribe; we may, however, point out that we did not observe specimens containing all of the distinguishing characters: coarse, prostrate and flattened stems, large leaves with scanty felt, purplish ribs and revolute margins and glomerate flowers. Specimens of v. *pinnatifida* from soil manured to excess are often prostrate with flattened stems and large leaves. When at the same time the plants grow in the shade, the leaves are less tomentous, but then the flowers are, as a rule, undoubtedly longstalked. The type specimens of ROTTBØLL were sent to him from SVERDRUP, missionary at Disko Bay 1764—88, and one specimen is said to exist in the herbarium of POUL EGEDE, missionary at Disko Bay 1736—40. The last mentioned collection belongs to the Botanical Garden at Copenhagen and probably this and other types of ROTTBØLL's plants may still exist. The specimens collected by HOLBØLL, at Umánaq and mentioned by OSTENFELD l. c. were collected between 1825—28!

   Besides ROTTBØLL's specimens (collected near Jakobshavn or Christianshaab?) the var. *prostrata* has been recorded from Uperniviarssuk 73°28′ (RYDER). RYDBERG (l. c. pag. 180) considered this plant as belonging

to *P. emarginata*. Other records exist from Godhavn (Margrete Smith) and Christianshaab (V.), and we can add Umánaq (Lundager) and Jakobshavn (A. P. Olsen). The flowers of the last mentioned specimen are glomerate, but the flowering is in its very beginning. The specimens of Lundager have pedunculate flowers, but the ribs are not purplish.

4. var. **pinnatifida** Lehm., Th. Wolf, emend. (Syn. *P. quinquefolia* Rydb. Mem. Dep. Bot. Columb. Univ. 1898. *P. subquinata* Rydb. Bull. Torr. Bot. Cl. 28 p. p. 181, 1901 *P. nivea* ε *subquinata* Lange, Consp. Fl. Groenl. p. 9, 1880.

   The common form in our area. Exceedingly varying according to the conditions of the habitat. As a dwarf form from dry rocks with scanty snow covering during winter, we consider:

5. var. **uniflora** (Ledeb.) Th. W. (Syn. β *arctica* Cham. & Schl., Lange l. c. *P. subquinata* var. *Pedersenii* Rydb. Bull. Torr. Bot. Cl. 28, p. 182 and probably var. *arenosa* Turcz., Lange l. c. p. 236 = *P. nivea altaica*, Bunge, Rydb., l. c. p. 181.) The range of this form is in our area, identical with that of 4, with which it is connected through numerous transitions. The most extreme forms are densely tomentous and with few flowered stems, recalling the aspect of *P. Vahliana*. In fact Th. Wolf placed the var. *Pedersenii* as a synonym under *P. Vahliana*, although the pubescense is pure white and not yellowish, the flowers smaller etc.

Summarizing the above remarks there are — in our opinion — only two unities of a higher order in our area, viz. a common: *P. nivea pinnatifida* and a rare: *P. nivea vulgaris*. Whether they are independent, hereditary constant species or subspecies or only varieties of the same species we cannot at present say. The decision must be left till future observations and cultivating experiments have settled the point.

V 199. **Potentilla Vahliana** Lehm.

On dry sand and gravel, rarer in stony soil.

Disko: Very common, especially on the north-land, but also in alpine stations or on barren basalt-gravel on the south coast to 69°15′ (P.).

Hare Ø (Taylor; P.).

Mainland: The basalt- and sandstone-domaines of Nûgssuaq, common; south of Torssukátak at Ritenbenk (V.; Bg.) ca. 69°45′ and quite isolated on the Præstefjæld at Holsteinsborg 66°55′ (W. & H.).

A decided northern type. The above mentioned localities are the southern limit of the species.

Ascends the hills to the snowline.

Abundantly flowering and fruiting; it is one of the first flowering, most beautiful and largest spring flowers of Disko.

Usually snowless during winter, the live buds protected by a dense covering of withered leaves.

A 200. **Potentilla Ranunculus** LANGE.

In vigorous meadows.

Disko: Kûgaq at Mudderbugt 69°45′ (Htz.; several times re-found here P.).
Mainland: Majorqarssuatsiaq 70°10′ (Bg.).

For the rest only once collected on the east coast of Greenland 63°40′.

Outside Greenland only known from the sub-arctic part of Eastern America, hence it must be settled as a decided southern type.

Flowers abundantly, but fruits are only developed in good summers.

Hibernates covered by snow.

V 201. **Potentilla emarginata** PURSH.

In fell-fields, gravelly and rocky soil, herb-mats and sometimes in heath.

Disko: Common on the north-land and in the two northmost fjords. In Diskofjord and on the south coast scarce, usually alpine or in barren places in the lowland (P.).

Hare Ø (P.).

Mainland: Nûgssuaq peninsula, common; especially in the basalt- and sandstone-domain. South of Torssukátak rare. Ritenbenk (V.); Jakobshavn (Bg.); Manîtsoq at Egedesminde (K.); N. Strømfjord (Korn.; not found by P. & E.); N. Isortoq (Korn.) Præstefjæld at Holsteinsborg 66°55′ (Htz.) only alpine.

A northern type, the above mentioned localities represent the southern limit. Ascends the hills to the snowline.

Flowers and fructificates abundantly.

Often snowless during winter. Not much varying. In moist places a tall form occurs with large, dark-green leaves, leaflets obtusely denticulate. On dry rocks the forms are low and stunted, yellowish-green, with acute teeth. (Cp. ABROMEIT pag. 8 et sq.).

Λ 202. **Potentilla alpestris** Hall. fil. (Syn. *P. maculata* Pourr.; *P. Langeana* Rydb.).

In herb-mats and copses.

Disko: Rather common on the south coast. In Diskofjord on the north coast and at the hot springs of the south coast. On the north coast of Mellemfjord to 69°45′; from Mudderbugt to Kvandal behind Ujaragsugssuk 69°45′ (P.).

Hare Ø. The south coast, scarce 70°22′ (P.).

Mainland: Ritenbenk 69°45′ (V.); Jakobshavn (Sør.); Egedesminde (Sør.). On the mainland s. o. Ikamiut island 68°23′ common (P. & E.).

A southern type, the above mentioned localities represent the northern limit of the species in West Greenland.

All the mentioned localities in the lowland.

Abundantly flowering and fruiting.

Hibernates covered by snow.

Rather variable, some of the forms certainly depending on the quality of the habitat. *Var. hirta* Lange is in well-marked forms a rather deviating type, by Rydberg l. c. p. 179 considered an independent species: *P. Langeana* Rydb.; it is distinguished by several flowered cymes and the long pubescence of the leaves, but also by the more acute teeth, the longer and more acutish bractlets and narrower sepals. This form seems to be more common than the mainspecies; it is sometimes very tall and robust.

As most of the numerous European forms of the comprehensive collective species *P. alpestris* are constant in culture, the same may perhaps be the case with this.

P. rubens Vill. is recorded from Godhavn by Rowlee & Wiegand; but as this Mediterranean species has been fcund nowhere else in Greenland I am inclined to refer the plant to the form-circle of *P. alpestris*.

• 203. **Potensilla Frieseana** Lange.

This remarkable plant has only once been recorded from Kuánerssuit in Diskofjord 69°35′ (Th. Fr.)

In vain I have searched for it here during many years. Of the recent monographers of the genus Rydberg accepts it as a valid species rather deviating from the other ones; but Th. Wolf reduced it to a form of *P. alpestris*. The most remarkable characters is the dense glandular pubescence. But as *P. emarginata* also normally shows a glandular covering (see Abromeit l. c., Knud Jessen, Medd. om Grl. 37, p. 39). I feel rather inclined to consider *P. Frieseana* a luxuriant form of this species or a hybrid between *P. emarginata* and *P. alpestris*, both growing plentifully at Kuánerssuit.

! 204. **Dryas integrifolia** M. VAHL.

In heath, sandy and gravelly soil, often at the borders and in the deltas of glacier-torrents washed down from the highlands; also on fresh morainic soil and in fell-fields.

Very common throughout the whole area.

Narrowleaved, highland specimen of *Dryas integrifolia* with new shoot, representing the f. *intermedia* NATH. From gravel-bank in a river delta.

Widely distributed in West Greenland and without northern limit, also found in the southmost Greenland but, according to ROSENVINGE, very scarce south of 64°. Hence a n o r t h e r n t y p e.

Abundantly flowering and fructificating.

Often snowless during winter.

Of the variations of the species, var. *intermedia* NATH. (Öfv. K. Sv. Vet. Ak. Förh. 1884, Nr. 1, p. 24) has been discussed several times, because the existence of this form has been considered a support of

the argument that *Dr. integrifolia* was only a variety of *Dr. octopetata.* This argument must, however, be discarded, because the var. *integrifolia* is merely an ecological form (The same view has been suggested by SIMMONS: Ellesmereland, p. 45). Plants with leaves larger than usual, with not revolute margins and better developed leaf-teeth occur in well watered and somewhat shaded localities. But the finest specimens are to be met with on gravelly banks in river beds. Narrow-leaved highland forms are often washed down and anchored here. The new shoots developed in this habitat are quite different: they represent the typical *intermedia*-form. Also the flowers developed under such favourable circumstances will hardly differ in size from *Dr. octopetala* (see figure).

On the poorest and dryest tertiary sandstones occur forms extreme in the opposite direction: the leaves are strongly revolute, linear, nearly ericoid.

Very different and without any transitions to the main-species is the var. *canescens* SIMM., of which I have published a figure Medd. om Grl. 50, p. 379, fig. 13. It is very rare. In our area we only observed it in valleys to the head of Nordfjord on Disko 69°55′ and at Marraq near the mouth of the big river of Nûgssuaq peninsula 70°30′. The very few records, previously known, are all north of our area, and this variety may perhaps be considered a high-arctic type.

Λ 205. **Alchimilla alpina** L.

In herb-mats and on luxuriant slopes.

Disko: Near Godhavn (?) (Tarr. & Martin); in Blæsedalen (Th. H.), during many years searched for by us, but in vain.

Mainland: N. Isortoq 67°15′ (Ros.); Præstefjældet near Holsteinsborg (W. & H.); P. & E.); Amerdloq about 66°55′ (W. & H.).

A decided northern type; the above mentioned localities represent the northern limit in West Greenland. Common south of 64° (Ros.).

Our specimens were not flowering Aug. 6. 1914 (an unfavourable summer), but the specimens had fruits from the preceding year.

Hibernates covered by snow.

Λ 206. **Alchimilla glomerulans** BUSER.

In vigorous herb-mats on, Disko preferably at the hot springs and their outlets.

Disko: The south-land from Mudderbugt to Blaafjæld in all suitable places. In the valleys as well. Diskofjord: common at the hot springs and in a few other places. Mellemfjord: in a few places on the north side of the fjord, at Sarqardlît silardlît and Ikorfarssuit ca. 69°45′. On the west coast in N. Laxebugt 69°35′ and 69°42′.

Mainland: Jakobshavn 69°13′ (W. & H.); Kangerdluarssuk at Agto (E. P.) 67°55′; N. Strømfjord 67°40′ (Korn.); S. Kangerdluarssuk, ca. 67° (W. & H.), in the fjords east of Holsteinsborg from several places, but not as common as on South-Disko (many collectors).

A southern type, the above mentioned localities represent the northern limit of the species in West Greenland. Common south of 67°.

All the mentioned places in the lowland.

Abundantly flowering and fruiting and attains to great vegetative power. Next to *Archangelica* it has the largest leaves among the plants of Disko, sometimes with a broadness of 12—15 cm and a midrib of 5—8 cm in length.

⊥ 207. **Alchimilla minor** HUDS. subsp. **filicaulis** (BUSER) LINDBERG fil. (Die nordischen *Alchimilla vulgaris* Formen und ihre Verbreitung. Acta. Soc. Scient. Fenn. 37, Nr. 10, 1909).

Only found once in Amerdloq-Fjord at Holsteinsborg 66°55′ (V.).

A decided southern type; the next following locality ca. 65° and only in the southmost part of the land fairly common.

Perhaps overlooked now and then or, in notes mistaken for the preceding.

XXVI. Callitrichaeae.

The *Callitriche*-species observed in Greenland occur near the borders of shallow lakes, often hid among the stalks of *Carex* species. The known localities lie rather isolated between 70° and 60°. As most of the aquatic plants in Greenland they must be settled as decided southern types.

If the numerous pools and ponds in the gneiss-domaines of Greenland were sufficiently investigated it would no doubt become apparent that the *Callitrichaceae* and other small aquatic plants have a rather continuous extension.

All the *Callitriche*-species, found in Greenland, flower and fructificate; hitherto they are only found in the lowland. They hibernate enclosed in ice, because of their occurrence in shallow places in the lakes, which freeze to the bottom during winter.

⊥ 208. **Callitriche verna** (L.) KÜTZ. var. **minima** HOPPE.

Disko: Mudderbugt 69°45′ (Htz.), the northern limit

Mainland: Jakobshavn 69°13′ (Sør.); the archipelago of Egedesminde from Ikamiut to Qeqertarssuatsiaq, from several places (Kr.); Holsteinsborg (W. & H) southwards herefrom not observed till 60°—62°.

⊥ 209. **Callitriche hamulata** KÜTZ.

Mainland: Archipelago of Egedesminde from Ikamiut to Qeqertarssuatsiaq, ca. 68°40′ (Kr.): the northern limit. From this domain southwards not observed till 65°, 64°25′ and between 60° and 61°.

⊥ 210. **Callitriche autumnalis** L.

Disko: The north-west coast at ca. 70°10′ (P.); at the mouth of Nordfjord 69°55′ (P.); in pools in Blæsedalen at Godhavn 69°17′ (E. P.; Th. P.).

Mainland: Sermermiut at Jakobshavn 69°13′ (P.); archipelago of Egedesminde: in some places in the Nivâq-Bugt 68°35′ (Kr.).

Only found in the mentioned places in Greenland. The specimens from the two northmost places are very small; the leaf-bearing sprouts only 15—35 mm long with 8—14 pairs of leaves. The leaves 5—10 mm long, 0,4—0,8 mm broad. But the specimens from Blæsedalen sometimes become 20 cm long in favourable summers.

Also in Greenland a perennial.

XXVII. Empetraceae.

| 211. **Empetrum nigrum** L.

In heath, moss-bogs, sometimes at the edges of willow-copses.

Very common throughout the whole area.

Widely distributed in Greenland, without southern limit and perhaps also without northern limit.

From the coast ascending to considerable altitudes, but not as far as, for instance, *Cassiope tetragona*, and never as a pioneer on fresh morainic soil.

Abundantly flowering and fruiting.

Normally covered by snow during winter.

Empetrum is the most important heath-species for the natives, who use it for fuel; the berries are commonly gathered and eaten.

XXVIII. Onagraceae.

Λ 212. **Epilobium anagallidifolium** (L.) Lam.

In open spots in moist heath, moist places in fell-fields, often on fresh moraines, along water-courses; sometimes in herb-mats.

No doubt often overlooked because of its diminutiveness.

Disko: On the south-land and the valleys here, Diskofjord and Mellemfjord known from many places; undoubtedly rather common. In valleys from the head of Nordfjord, common; the north-west coast, rather common far from the coast (P.).

Mainland: Paotût 70°12′ (Htz.); southwards not observed till N. Isortoq 67°15′ (Ros.) and Holsteinsborg 66°55′ (W. & H.); no doubt overlooked.

A southern type; north of the area found a few times up to 72°8′ (P.). Also overlooked south of the area; it seems to prefer the coast-region, not being able in competition to hold its own.

At Paotût ascending to 800 m.
Flowers and fructificates abundantly.
Hibernates covered by snow.

∧ 213. **Epilobium lactiflorum** HAUSSKN. (*E. alpinum* TRELEASE: Revision of the American species of Epilobium Rep. Miss. Bot. G. I. 1891).

Very rare in the area, only at hot springs, in very moist places among mosses.

Disko: Lyngmarken (V.; Th. Fr.; P.); Engelskmandens Havn (P.); Kuánit (Th. P.), Torskenæs (Th. P.); Mellemfjord, Kuánit and Ikorfarssuit 69°44′ (P.).
A decided southern type, north of the area found once at Kûk 70°40′ (Vh.). South of the area observed at 64°10′ and from several places between 60° and 62° (Ros.).

Abundantly flowering and fruiting. Forms winter-buds.
Abundantly covered by snow and ice during winter.

∧ 214. **Epilobium Hornemanni** REICHENB.

In similar places together with the preceding, but much more frequent.

Disko: The south-land from Mudderbugt westwards, Diskofjord, N. Laxebugt, the north side of Mellemfjord at most of the hot springs (P.). The Waygatcoast at the springs of Ũnartorssuaq 69°50′ (P.).
Mainland: At the hot spring on Sarqardlît at Egedesminde 68°40′ (P.); Sarfarssuaq in N. Strømfjord 67°50′ (P. & E.); Præstefjæld at Holsteinsborg 66°55′ (W. & H.); from here not observed southwards till Godthaabsfjord and South Greenland 60°—62°.

A southern type, the mentioned places represent the northern limit in Greenland.
Abundantly flowering and fruiting in not too cold summers. Forms winter-buds.
Hibernates covered by snow and ice.
At Kuánit in Mellemfjord 69°43′ TH. PORSILD collected a specimen just flowering, July 9. 1911, deviating much from the normal *E. Hornemanni* by its large and broad leaves. It resembles *E. alsinefolium* from Iceland, leg HELGI JÓNSSON, very much. ROSENVINGE has observed similar presumed transitorial forms in South Greenland, see Tillæg p. 660.

⊥ 215. **Epilobium palustre** L. var. **labradoricum** HAUSSKN.

In similar places, often together with the preceding, but much rarer.
Disko: Near Godhavn (Bg.); Engelskmandens Havn (P.); in valleys at Skansen 69°25′ (P.).

Mainland: N. Strømfjord, Eqaluarssuit 67°36′ (P. & E.); herefrom not observed till Godthaabsfjord, and southwards more frequent.

A decided southern type; the above mentioned places are the northern limit.

Usually flowering and ocasionally fruiting. Forms winter-buds.

Hibernates abundantly covered by snow and ice.

A 216. **Chamaenerium angustifolium** (L.) Spach.

(*Epil. spicatum* Lam.).

In herb-mats and at the edge of copses.

Disko: The south coast, near Godhavn, eastwards along the coast in several places; at least east of Skansen 69°25′; the inner part of Diskofjord on the northern side 69°30′—35′.

Mainland: Christianshaab 68°45′ (Giesecke); s. o. Manermiut 68°30′ (K.); N. Strømfjord; Tiggaq (Sør.), Eqaluarssuit 67°36′, very scarse (P. & E.); N. Isortoq (V.); S. Kangerdluarssuk (W. & H.; Ros.); in the neighbourhood of Holsteinsborg and in the fjords from several places, but everywhere scarce. Not common till south of 64° (Ros.).

A southern type; the above mentioned places represent the northern limit. Records from Upernivik, by Kane, must be considered as improbable.

Within the area only in the lowland.

Usually late, but abundantly flowering; but strange to say it is nowhere in Greenland observed fruiting, hence totally deprived of the power of migration.

The variety *intermedium* (Wormskj.) Lange, as defined by Lange seems to me hardly to deserve the name. I rather suppose that Wormskjold has been thinking of a hybrid between *Ch. angustifolium* and *latifolium*.

I 217. **Chamaenerium latifolium** (L.) Spach.

In very different kinds of soil, but most vigorously on sand in and by water-courses and river-deltas. Here it forms extensive patches, visible far away during the flowering season. Also in not too dry heath and fell-field.

Very common throughout the whole area.

Widely distributed in Greenland with neither northern nor southern limit, from the coast ascending to the snow-fields.

Abundantly flowering, and in the lowland often fruiting, but frequently so late that the capsules usually do not open till the fall of snow. Often washed down from the highland by brooks.

Perhaps sometimes snowless during winter.

Varies according to the quality of the habitat. The variety *steno-*

petalum Hausskn. (*tenuiflorum* Th. Fr. & Lge.) seems to lie within the limits of variation of any patch and thus hardly to deserve the name.

On the other hand the var. **albiflorum** Nath. is hereditary constant. This fact may especially be observed at the borders of river beds, where a series of colonies may be started from a single patch and occuring along one branch of the river, but not along the others.

• 218. **Chamaenerium ambiguum** Th. Fr. & Lange (? *Ch. angustifolium* × *latifolium*).

Strange to say this presumed hybrid has only been observed on Disko, but in return rather often. In Lyngmarken at Godhavn it has been found at least five times, and at Sinigfik 69°22′ also rather often; but it seems only to occur in few specimens. I have not been so fortunate as to find it myself in spite of intense searching in places where both species were growing side by side. The specimens from Sinigfik were collected flowering, Aug. 11. 1907, and the collector (L. Geisler) adds the information that it was growing among *Ch. latifolium* and *Ch. angustifolium*, and that the last was not yet flowering. Its ovaries are big like those of *latifolium*, but they shrink in drying, and the ovules shrivel completely; thus it seems incapable of fruiting.

XXIX. Halorrhagidaceae.

⊥ 219. **Myriophyllum spicatum** L. var. **capillaceum** Lange.

In ponds and pools.

Only observed a few times. Sofiehavn at Tasiussarssuaq 68°25′ (Bl.); Itivneq at Holsteinsborg (W. & H.); in a lake at the head of S. Strømfjord 66°55′ (Jens.); found a few times at Ikerasak 70°30′ (S. H. Vh.).

A decided southern type in Greenland; only known from the mentioned places.

Some of the specimens from Ikerasak collected by Vanhøffen were flowering already on the July 22, and therefore I suppose it may be able to fructificate.

Hibernates under ice.

XXX. Hippuridaceae.

Λ 220. **Hippuris vulgaris** L.

Will hardly be wanting in any smaller lake or pond which do not dry up during the summer. It is the most common and widest distributed aquatic plant of Greenland.

In West Greenland known from Cape Farewell to 70°30′, but being found at 77° on the east coast, this place can hardly be the northern limit.

Usually abundantly flowering, but not all the fruits ripen; where the pond is frozen up with early night-frost all the shoots, protruding above the ice, are killed.

Does not vary much. The form var. *maritima* (HELLENIUS) HARTM., supposed to be identical with *tetraphylla* L. fil., is recorded the most common in Greenland. Typical forms of var. *tetraphylla* with few short and broad leaves are, however, rather scarce. Well developed specimens collected towards the termination of the summer seems to me not much deviating from the European form.

The same is said by OSTENFELD of specimens from East Greenland (Medd. om Grønld. 43) and by AGNETE SEIDELIN of the great majority of the investigated arctic specimens (ibd. 36, p. 302). The latter author refers it to f. *litoralis* Lindb. fil.

Cornus suecica L.

Recorded from Egedesminde Ø as collected with ripe fruits Sept. 28. 1893 by P. H. SØRENSEN; on the label is noted that the plant also occurs at Godhavn. In both places I have searched for it during many years, but in vain; and it is very difficult for me to believe that such a conspicuous rare plant, whose fruit, moreover, is a berry, might really be overlooked in this place where I have lived and collected for 13 years. In West Greenland it is only known from 60°—62° and 64°—65°47′. Neither is it met with in the southmost part on the outer islets (Ros.).

XXXI. Umbelliferae.

Λ 221. **Archangelica officinalis** HOFFM.

On luxuriant grassy slopes where the cover of snow is constantly recurring, but early disappearing and, where during the period of vegetation, there is an abundant supply of pure running water; on Disko only near the hot springs and their outlets. The most prominent representative of the southern types and always found together with several others.

Archangelica is the largest and most conspicuous herb in Greenland and would, if only for this reason, easily be recognized by anybody. But as it, moreover, is much coveted by the natives who eat its young stems and leaf-stalks raw, often untertaking long journeys and troublesome excursions to gather it, the determination of its area of distribution

is far easier than that of any other plants, a trustworthy information, as to its occurrence or absence, can be had in any locality.

To the following account I have used, besides literature and personal investigations, a good deal of information, mostly verbal, from natives of the different localities. Most complete and most reliable are the informations relating to the Disko-fjord which all are due to Isak Danielsen, an Eskimo, who is conspicuous for his remarkable aptitude for geography. On a map, drawn by himself, of those parts of the Disko island known to him, he has on my request, among other things, marked the occurrences of *Archangelica* known to him. — In the enumeration of the occurrences, an (!) indicates that I have seen the spot myself, or, at any rate, the plant from there.

To facilitate the comprehension of some of the place-names in the following account I will just point out, that the Scandinavian word for *Archangelica:* Kvan already in the olden times was adopted into the language of the Greenland Eskimos in the form of *kuáneq*, plur. *kuánit*. From this the following forms are further derivations: *kuáninguit* i. e., the small (or few) Kvans, *kuánerssuit* i. e. the large (or many) Kvans, *kuánikasît* i. e. the poor Kvans, *kuániârssuit* i. e. the extraordinary (or remarkable) Kvans etc. etc.

Disko.

I. Mellemfjord.

On the northern shore, at Kuánit, 69°44′(!) in a rich and luxuriant herb-mat at the outflow of several springs together with *Cystopteris*, *Polystichum Lonchitis*, *Poa alpina*, *Luzula parviflora*, *Sibbaldia*, *Alchemilla glomerulans*, *Potentilla alpestris*, *Stellaria borealis*, *Epilobium lactiflorum*, *E. Hornemanni*, *Pirola minor*, *Bartschia*, *Veronica alpina*, *Taraxacum croceum* etc. — Further at the head of the fjord, as well as on the southern shore near the hot springs (K. J. V. STEENSTRUP, Medd. om Grl. 24, p. 287).

II. Nordre Laksebugt (Eqaluit).

In the valleys some kilometers away from the coast near the foot of the mountain Igdlorssuaussaq, 69°38′, also in luxuriant herb-mats (P.).

III. Disko Fjord.

1) The north coast of the northern branch at 69°34′—35′, in four spots, the two westernmost ones near the small islet Qeqertârssuk, the largest and eastmost opposite the north point of the big island Qeqertaq. Here together with the same as above and with *Dryopteris Linnaeana*, *Habenaria hyperborea*, *Linnaea borealis*, *Hieracium groenlandicum*(!) — 2). In the northward directed branch are two localities on the eastern shore, at ca. 69°32′, one of them is named Kuánikasît(!). In the valley leading from this branch to Mellemfjord are 4 or 5 localities on the northern side of the valley, 69°38′. — 3) In the branch Kangerdluarssuk, inland from Eqalúnguarqat, 69°31′ (!) as well in the valley Eqalúnguit Itivnerit leading from this branch to the fishing place Eqalúnguit, in numerous spots (!). Along the foot of the hill 3125′ of the map, on its southern side, is a widely extended occurrence of *Archangelica*, the western end of which is called Mamartut (the well-tasting), the eastern Qiterdlît (the middle ones i. e., in proportion to the following). — 4) At the inner branch

of the fjord along a brook from the hill 3125′ to the bay at Eqalúnguit; here the occurrence is called Tiggait (the unpleasant smelling). Somewhat eastwards are several smaller localities near the same hill and in a valley leading behind the northern side of the hill to Avdlãngissat is a very large occurrence of the plant at 69°36′. Farther inwards at the same branch the occurrences of *Archangelica* extend with small interruptions from Orpît to Kuánerssuit at the head of the branch. The last mentioned locality I have described elsewhere (Medd. om Grl. 25 p. 188—98). As far as botanical literature is concerned, the word Kuánerssuit denotes the northern shore here, but, according to the traditions of the natives, the name refers to the shore inside the very head of the branch. This place is now inaccessible during summer because of the filling up of the fjord by the action of the torrents here. The *Archangelica*-plants are here said to reach a size so large that the stems will project when carried in the skin of a fullgrown saddle-back seal. — At Angujartûtit, where the shore of the same bends in a south-westerly direction, is an area with numerous hot springs, 5—6 kilometers in length and more than one kilometer wide. *Archangelica* grows over the whole area, the biggest occurrence I have seen. — 5) In the southwestern branch of the fjord, *Archangelica* occurs at three spots, one somewhat inside Ikineq, 69°29′(!) the other about midway between that place and Nãngissat. — 6) In the branch Kangikitdleq are two localities at the head of the branch near the valley leading northwards, 60°28′ and one on the southern shore, Kuánikasît, 69°27′. — 7) Finally *Archangelica* occurs on the southern shore of Qeqertaq, at 69°29′ and on the southern shore of the fjord proper, inside Nipisat Bay, 69°25′, whereas it is wanting at the hot spring Ũnartoq on that shore.

IV. South Coast of Disko and valleys hereof.

Along the shore at the foot of the mountain Blaafjæld (Uivfak) about 54° Long. W. *Archangelica* occurs in small quantities in several places, turning round the southeastern corner of the mountain, where they grow denser and reaching up the valley Itivdleq, ending at the valley Tukingassoq, leading behind Blaafjæld. — From Kangerdluarssuk (Fortune Bay) to Augpilagtúnguaq are 4 or 5 small occurrences. From here they occur almost continually over Quvnermiut (!) to Engelskmandens Havn, 69°15′ near Godhavn. In Lyngmarken only a few individuals occur. In Østerdalen and at the springs in that valley *Archangelica* was absent, but several years ago seeds were sown here (E. P.) and seedlings are found. In Blæsedalen *Archangelica* grows from the foot of the mountain Skarvefjæld and half-way to the fjord, but scarce (!). At the foot of the said mountain, towards the sea, we have a very luxuriant locality, named Kuánit, often mentioned and figured because of the picturesque basalt-columns. Farther eastwards near the cliff Per Dams Skib (Asungasungâq) we find *Archangelica* at a considerable height over the sea. Also at the mouth of Brede Dal, 69°18′ the plant occurs in plenty (!).

From Brede Dal eastwards *Archangelica* occurs at Puilassúnguaq (!), Taserârssuk and Sinigfik, 69°19′—20′(!), Marrait, Kigdlûssat and Sarqarssuaq, 69°20′—22′, Tuapait 69°25′ and in a valley inside the settlement of Aumarûtigssat, the river of which ends at Kigdlusaitsut nûat. From this point eastwards towards Mudderbugt no occurences are known.

V. Mudderbugt and valleys to that bay.

Archangelica occurs on the southern side, rather far from the shore, 69°40′, and on the northern side, also at same distance from the bay. Hartz has, in Medd. om Grl. 15, p. 55, given a description of the place and its vegetation. Finally at the head at the largest valley to Mudderbugt, Kvandal behind Ujaragsugssuk, ca. 69°47′, described by Porsild, l. c. p. 153. This place is the northernmost known in

Greenland, only in Norway the plant occurs farther north, 70°11′ (Normann: Norges Arktiske Flora I, 1, p. 317[1]). Strange to say this occurrence is at the same time one of the most elevated known in Greenland, namely 550 m above the sea. Only at Angmagssalik in East Greenland Kruuse records a higher station.

On the Waygat-coast of Disko *Archangelica* does not occur, neither in the big valleys nor near the hot springs at Ũnartoq and Ũnartuarssuk. About the big valley of Kûgánguaq Giesecke remarks: »*Archangelica* wächst im Thale in beträchtlicher Menge«, but I have convinced myself about the incorrectness of that statement. I may point out here that the work of the celebrated author, given in the form of a diary, is not written in the field, but during his winters in Greenland, nay partially in Denmark after his return, and several minor inaccuracies, also in geographical and other respects are due to slip of memory.

The Mainland of West Greenland.

In his Conspectus Fl. Groenl. Tillæg p. 259 Lange records *Archangelica* as »common to 69°«, but in the second supplement p. 682 Rosenvinge corrects this statement and records S. Kangerdluarssuk, 67°0′ as the northernmost locality on the mainland. Besides it was known from Ikertôq-fjord 66°45′, but nowhere else recorded by the numerous collectors who travelled in the district of Holsteinsborg; we found the plant at one new locality here, viz. Naujarssuit in Qeqertalik-bay 66°44′ (P. & E.), but we omitted to collect information from the natives.

The plant does, however, occur farther northwards, thus at several places in N. Strømfjord and therefore undoubtedly also in the N. Isortoq-fjord, lying between the two areas. We shall here mention in full the localities seen by us or mentioned to us by the natives. Most of our records are due to the native Andreas Brandt at Kangâtsiaq, who marked for us every occurrence, known to him or to his much travelling countrymen, in a map of large scale.

I. Nordre Strømfjord and its branches.

1) South Coast of mainbranch: south of Taseralik, 67°25 N. 53°30 W. Tiggak, 67°32′ (plants seen by us!). Eqaluarssuit 67°33′ N. 53°8′ and 67°35′ 52°58′ (E. P.); Ukusik in Ungôriarfik 67°45′ N.; east of Sêrsínilik 67°40′ N. 51°32′ W.; Naujalik, 67°43′ N. 51°18′ W.; east of Sánerut 67°38′ N. 50°58′ W.; West of Qardlínguit, 67°37′ N. 50°50′ W.

2) North coast: north of Kavfit nûat, 67°38′ N. 50°30′ W.; at 67°35′ N. 50°38′ W.; at the head of Kordlortoq, 67°39′ N. 50°35′ W.; point north of Kordlortoq, 67° 38′ N. 50°47′ W.; point west of Ujarasugssulik 67°40′ N. 50°52′ W.; Ipiutarssuaq 67°43′ N. 51°2′ W.

3). Sarfarssuaq-branch: east of Ivnalik 67°43′ N. 50°53′ W. (P. & E.). Kuániârssuit, 67°44′ N. 50°40′ W.

4) Qarsorsaq-branch: at the head, about 67°52′).[2]

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[1]) In a paper: Über die Engelwurz. Schweiz. Wochenschr. f. Chemie u. Pharmacie 1901. M. Rikli has felt himself called upon to correct my statements, but he has certainly first and foremost saddled me with the mistake which he corrects. A critic ought, at any rate, to be able to read aright!

[2]) The existing maps are here very deficient, large branches are only loosely suggested, but not correctly. Hence the positions of this and some of the subsequent localities are rather uncertain.

5) Nuerssorfît-branch, eastern shore at Upernavik, 67°52′ N. 51°7′ W. (P. & E.) and at Sikût, 67°55′ N. 51°10′ W. as well as a locality on the peninsula Qeqertaussaq at nearly the same latitude.

II. Arfersiorfik-fjord: at the head of a small islet at 68°5′ N. 52°5′ W. Northern limit?

III. Ataneq-fjord: Kuánit near Qajuvfik on the southern shore and nearly opposite at Kuánínguit, somewhat west of Oqorutit. The position of both places unknown to us.

IV. Environs of Agto: eastern shore of the sound behind the island of Kangeq, 67°42′—48′; at the head of the small fjord Inuarutdligkat, east of the settlement of Agto, 67°55′; (plant seen by us!). (absent however in the fjord Kangerdluarssuk a little northwards (E. P.)); bay of Tâterait south of the settlement of Aqigsserniaq 67°50′.

The vegetative power of the Kvan appears to be comparatively uniform everywhere, perhaps it is somewhat greater on Disko than in the parts of the mainland treated of here. The Greenlanders often make a distinction between the taste of the Kvans from the different occurrences, and some of the place-names refer to this. In some places the Kvans are stated to be acrid (perhaps on account of anthocyanine and tannic acid?). The Eskimos greatly prefer the so-called »male« Kvans i. e. flowering specimens, whilst the »female« Kvans, plants which have not yet attained to flowering, are despised.

Kruuse states (Meddelelser om Grønland 30, p. 248) that the Kvan in several places near Angmagssalik must be supposed to have become extinct through excessive gatherings in the places most easy of access. We have not observed any distinct analogous cases of this kind, but it might be permissible to conclude that it is the case in Lyngmarken, where there has been an extravagant cutting down of the bush for more than 200 years, on account of which other southern plants undoubtedly have suffered severely. The Kvan is here exceedingly scarce. On the other hand so was also the state in 1870 according to Berggren.

In every locality known to us the Kvan flowers abundantly and fruits, too. Most frequently, however, only the earliest developed umbellets attains to ripening of their fruits, while all the others are overtaken in the autumn by the night-frost, often still in the state of flowering, and consequently killed. In winter the withered stalks of the Kvan are to be seen projecting above the snow, full of unripe fruits that have lost their power of germination. However, the numerous seedlings, found on every Kvan-slope, seem to indicate, that every year some of them attain to ripening.

The fruits are, of course, easily dispersed by water from the spring and carried down to the coast; on the other hand the power of dispersal over land seems to be exceedingly slight, although the large winged fruits are relatively very light. It is very common to see two grassy

slopes, apparently equally luxurious and under equally favourable conditions, parallel and close to each other, one of them containing Kvans, the other not.

Archangelica hibernates under thick layers of snow, often, but probably not always, with its root in soil that never freezes. On large root-specimens the terminal bud is larger than a clenched hand and contains a complete inflorescence. A little farther down several smaller buds are to be found in the axils of former leaves. KRUUSE states l. c. p. 246: »the specimens die after having set fruit«, hence it ought to be hapaxanthic. Another common appearance here is: an old root, that without any apparent cause, is decayed right down, but hence the axillary buds are set free, and the plant consequently perennial, being also ordinarily indicated as such in the Scandinavian Floras.

XXXII. Pirolaceae.

⊥ 222. **Pirola minor** L.

In copses and vigorous herb-mats, on Disko usually in shade; not in the heath.

Disko: Rare, perhaps sometimes overlooked; in the vicinity of Godhavn 69°15′, for instance in Engelskmandens Havn. (P.); Mellemfjord at Kuánit 69°44′ (P.); Mudderbugten 69°45′ (Htz.).

Mainland: Found once at Holsteinsborg 66°55′ (Th. Fr.); Jakobshavn 69°13′ (Sør.), in vain searched for here (P.).

A decided southern type, not common till south of 64° (Ros).

Only known from the lowland.

Late flowering, but fructificates at least in warm summers.

Hibernates abundantly covered by snov.

⊥ 223. **Pirola secunda** L. var. **obtusata** TURCZ (= v. *pumila* CH. & SCHL.; var. *borealis* LANGE).

In the shade under copses and tall herb vegetation, no doubt often overlooked because of its diminutiveness.

Disko: Near Godhavn 69°15′ in several places and gathered by several collectors. Brede Dal 69°18′ (Nygaard!).

Mainland: Præstefjæld near Holsteinsborg 66°55′ (W. & H.; P. & E.).

A dceided southern type in Greenland, only known from the mentioned places.

This form, known from sub-arctic America and Asia, but not from Europe, is rather deviating from the main-species, and as its ecological variations in Greenland do not seem to approach the European plant, it had probably better be considered an independent species.

V 224. **Pirola grandiflora** Radius (*P. rotundifolia* var. *gr.* Autt., var. *pumila* Hook).

On heath-land, sometimes in thickets and herb-mats.

Very common throughout the whole area.

Widely ranging in West Greenland, with northern limit north of 79°, however becoming scarce south of 64° (Ros.); East Greenland scarce. In Greenland a northern type.

Ranging from the shore as far as dense vegetation is found, not occurring in purely mineralic soil.

Flowers early and fructificates abundantly.

Normally covered with snow during winter.

Not much varying. At the borders of thickets, especially in the southern parts of the area taller specimens with richer inflorescences occur. Lange has reported a forma *lutescens* with yellowish petals. I am inclined to consider the plants in question only discoloured herbarium specimens. The petals of all live plants seen by us during many years were pinkish, not pure white as in *P. rotundifolia*, nor greenish white.

By several authors considered an arctic form of *P. rotundifolia*, but we think the morphological characters alone sufficient to keep it distinct (see for instance Radius: De Pyrola et Chimaphila Lips. 1821—29, Warming: Bot. Tidsskr. 15 p. 165, Abromeit: Bibl. Bot. 42a p. 47 etc.) Its distribution in Greenland shows, that it is of high-arctic, western origin, immigrated to Greenland over Smith' Sound.

The flowers of *Pirola grandiflora* are among the most fragrant in Greenland, the smell recalling that of *Convallaria majalis.*

Pirola rotundifola L. var. *arenaria* Lange (an = var. *arenaria* Koch?)

Under this name is several times recorded a plant from Southern Greenland, ranging from 60° to about 69°. I doubt the identity of the plants seen in H. H. with this European form, and I should rather consider them to be forms of the preceding grown in thickets.

⊥ 225. **Pirola grandiflora × minor** n. hybr.

Aug. 13, 1913 Thorbjørn Porsild collected two specimens of *Pirola* near the outflow of the springs in the valley Østerdalen on South Disko, 69°15′. He labelled them: "*P. grandiflora*, extraordinarily late flowering", as the said species that year everywhere was in fruiting stage at that date.

Unfortunately I did not see the plants till the winter 1913—14, when the collector had left Greenland, and during the subsequent years I

searched for it in vain on the habitat mentioned. Ordinarily a hybridation between the two species will not easily be effected, because *P. grandiflora* has ceased flowering when *P. minor* begins. But retarded flowers may sometimes be found on spots where the snow has lasted longer than usually.

Although I saw but two specimens I shall mention this probable hybrid here, not only to call the attention of later collectors to it, but also because so very few hybrids of arctic plants are yet known.

Plantae sat graciliores quam P. grandiflorae, etiam aliquantulum minores quam P. minoris specimina ejusdem loci. Folia tenues, non nitescentia, late ovato-elliptica, folia *P. minoris* similantia. *Corolla major quam P. minoris, minor quam P. grandifolia sicut utriusque rosaceo-albida. Petala late ovata. Stylus rectus, germine subduplo longior, superne dilatatus. Stigma quinquelobatum.*

Most of the above named characters do certainly agree with those of *P. media*, this species being, however, a tall plant of the woods in Europe, not occurring in Greenland. A hybrid between *P. rotundifolia* and *P. minor* has been observed in northern Fennia by KIHLMAN.

XXXIII. Rhodoraceae.

Ledum.

The History of the interpretation of the Greenland *Ledum*-forms (By M. P. P.).

LINNAEUS in his "Species plantarum", 1753 labelled a shrub, common in wooded bogs in Sweden, *Ledum palustre*, before his nomenclature often called *Rosmarinus sylvestris*. The plant was well-known to the Swedish people for its fragrance and it was used as a substitute for hops in brewing or as an insecticide. The name given by LINNAEUS, has been in later literature applied to the same plant from other parts of Europe, and C. FRIIS ROTTBØLL determined in 1766 the *Ledum* sent to him from Greenland as *L. palustre L.* (Act. Hafn. X. 1770. p. 441). Although ROTTBØLL's plants do not exist, we may infer from the collectors mentioned by him, that the plants in question belonged to the narrow leaved form (*L. decumbens*).

At the same time another *Ledum* was brought to Europe by several travellers from Greenland, Labrador, New Foundland and various parts af Canada. It was cultivated in most of the leading botanical gardens, and it became soon generally known under its trivial name "Labrador tea" or under the gardener's name "*Ledum latifolium*", being from the first what we now call a *nomen nudum*. The first valid description

is given 1771 by Oeder in "Flora Danica" fasc. X, tab. 567 "*Ledum groenlandicum, staminibus corolla brevioribus, foliis ellipticis. Anglorum Labrador-The.*" The same name was used in 1779 by Retzius: "Fl. Scand. Prodr." p. 77 and in 1786 in his "Observationum Botanicarum fasc. IV" p. 26. — In the year 1789 Aiton published the II vol. of his "Hortus Kewensis", where he p. 65 describes "the Labrador plant, introduced to Kew 1763", as "*Ledum latifolium, foliis oblongis margine revolutis, subtus tomentosis, floribus subpentandris.*" — Also Lamarck used the name *L. latifolium* in his "Encyclopédie" of 1789, p. 458—59, as did Jacquin: "Icones plant. rarior. III", tab. 464, 1786—93, and Willednow: "Enum. plant. hosti regii Berol", 1809, p. 450. In the later literature we find the name "*Ledum latifolium*" cited now with Aiton, now with Lamarck, Jacquin or Willdenow, as authors, and more often the name of Retzius is added to *Ledum groenlandicum* than that of Oeder.

A broad-leaved *Ledum* was also detected in Lapland by Wahlenberg and described 1812 in his "Fl. Lapponica", p. 103 as β *dilatatum.* He doubts the identity of this variety with *L. latifolium* of Willdenow.

Aiton also named l. c. a "Dwarf-Ledum", β *decumbens* from Hudson Bay and described it: *spithamaeum decumbens* in contradistinction to α "*bipedale erectum.*"

Of the early American writers Michaux "Fl. Bor. Americ. I", p. 259, 1803 only accepted *latifolium* (as a form of *palustre*) and *buxifolium* (= *Leiophyllum*), whereas Pursh 1814, "Fl. Amer. Septentr. I", p. 300 distinguished:

1. *palustre* L.
   β. *decumbens* Ait.
2. *latifolium* Lam. Willd.

To the distinguishing characters between 1 and 2 Pursh adds, quoted from Lamarck:

1. *palustre....staminibus denis corolla longioribus.*
2. *latifolium....staminibus subquinis corollam aequantibus.*

About *decumbens* nothing new was said.

A valuable contribution to the understanding of this last form was rendered by E. Meyer: "De plantis Labradoricis libri tres", 1830, p. 48—50. Meyer quotes his correspondent Herzberg, a missionary of the Moravian Brethren and — according to Meyer — a "vir botanicarum controversiarum plane ignarus." About the plant determined by Meyer, to *L. palustre* β *decumbens* Ait, Herzberg says:

"Der kleine Rosmarin; wächst an der Südseite der Berge, wo es trocken ist, und nimmt keine andere Pflanzen unter sich auf. Fängt Mitte Juny an zu treiben und blüht von Mitte July bis Ende August."

About *L. latifolium* Ait. (*L. groenlandicum* Retz.) he says:

"Der grosse Rosmarin. Blüht Mitte August."

In the discussion of the two forms MEYER mentions the broad-leaved varieties of *L. palustre* occurring in Europe (the var. *dilatatum* of WAHLENBERG) "in eadem radice haud raro conjuncta". He doubts the constancy of the length and the number of the stamens of *latifolium*, but nevertheless he considers this plant a valid species, without transitions to *decumbens*, and besides the differences given by HERZBERG, MEYER, adds:

	L. latifolium	*L. palustre decumbens*
stylus:	leviter flexus	omnino rectus
puncta auronitentia in bracteis:	copiosissima	rarissima
gemmae bractearum:	obtusissimae et fere semiglobosae	multo tenuiores magisque attenuatae

During his 8 years of indefatigable investigations of the flora of Greenland JENS VAHL made clear the main points concerning the Greenland *Ledum* forms and their distribution. In his labels he determined them respectively 1) *L. groenlandicum* and 2) *L. palustre* β *decumbens*. As to the occurring of the European form he demonstrates his doubt by labelling the plants "*L. palustre L.?*" "ad α accedens", or the like.

In his "Conspectus Florae Groenlandicae" 1880 JOH. LANGE enumerates:

L. palustre L.

α. *vulgare. Erectum, parum ramosum, foliis lanceolato-linearibus.*

β. *decumbens* AIT. *Trunco humili, subdepresso, saepius crebre ramoso, foliis anguste linearibus, gemmis florigeris ovoideis.*

L. groenlandicum OED. *Folia elliptica-ovalia, basi subcordata, pagina superiore dense rugoso-areolata, gemmae florigerae globosae. Flores saepe pentandri* (*teste* HOOKER).

LANGE states α to be rare in Greenland. Further he doubts the specific rank of *L. groenlandicum*, having seen specimens that according to the form of the leaves might as well be determined as belonging to one or another of the species. Previous to the statement of LANGE, HOOKER had stated the same opinion in his "Flora Boreali-Americana" 1840. in which II. p. 44 for the same reasons he reduced *latifolium* to a variety of *palustre*. And when ROSENVINGE in 1892

published his "Andet Tillæg" to Lange he further reduced *groenlandicum* to a variety coordinate with *decumbens* and *palustre* α, cp. p. 691.

The reduction of *L. groenlandicum* to a variety is, however, in direct opposition to the view of modern American florists and taxonomists. Having the profoundest knowledge of the plant from their researches in nature, they without any exception classify it as a separate species. And, we may add, as all modern dendrologists do, also in Europe where the plant still everywhere preserves its different aspect under cultivation; (see for instance C. K. Schneider: "Illustr. Handb. der Laubholzkunde" II. 1912 p. 469). As will be seen by our investigations we cannot but support this view.

Regarding the other *Ledum* in Greenland I (i. e. M. P. P.) cannot see but one taxonomic unit in it. I must confess that its variations on favourable habitats tend to develop larger leaves, but on the other hand I never found plants like typical specimens of *L. palustre* from Northern Europe. There always remains a certain characteristic habit giving it a different appearance. And as the geographical features seemed to support my view of *L. decumbens* as specific distinct from *L. palustre*, a closer investigation of a large material became desirable. As our home in Greenland is situated far to the north of the area of *L. groenlandicum* and as our material of herbal specimens of this species and still more of *L. palustre*, was too scanty, we applied to the Trustees of the Botanical Museum at Copenhagen and obtained a large material. As form and size of the leaves hitherto yielded the most conspicuous distinguishing characters, an investigation of those points was chosen as our main object, the more so because time was scarce, the printing of our M. S. had been begun. This investigation was carried out by E. P. alone.

The distinguishing characters of *Ledum palustre*, *L. decumbens* and *L. groenlandicum*. (By A. E. P.)

In order to ascertain the size and form of the leaves of *Ledum* I investigated the material preserved in the herbariums of the Arctic Station in Greenland and of the Botanical Museum at Copenhagen. For the great majority of specimens I took the determinations, as they were left by the several collectors, only of a slight number of specimens have I altered the determinations, after having found a new distinguishing character (see below). For the investigation a well developed year's shoot of every specimen was taken and the leaves were measured: the length without the petiole, the breadth without the

revolute margins. The lowest and the topmost leaves, ordinarily somewhat smaller than the rest, were not taken into consideration. On shoots with a sufficient number of leaves, 10 were measured, otherwise a smaller number. In all 923 leaves of 135 specimens were investigated.

In the following lists **I—V.** marks

N the number of leaves measured,
l the length in millimetres,
b the breadth in millimetres,
l/b the ratio between lenght and breadth, i. e., the shape of the leaves.

The lists are arranged after the ratios, beginning with the broadest and ending with the narrowest leaves.

I. *Ledum decumbens.*

West-Greenland, 63°—70° Lat. N.

			N	L	b	l/b
Kangerdluarssuk	72°38′,	Ryder	7	11,9	3,1	3,84
Qeqertalik	66°44′,	Brummerstedt	6	13,5	3,0	4,50
Nákajanga	66°50′,	J. A. D. Jensen	6	8,7	1,9	4,58
Qeqertarssuaq	72°53′,	Ryder	5	7,5	1,6	4,69
Godhavn	69°15′,	R. Brown	5	13,2	2,7	4,78
Holsteinsborg	66°56′,	Lundager	6	11,1	2,3	4,83
Nunatarssuaq	64°30′,	J. Vahl	7	9,1	1,6	5,69
Holsteinsborg	66°56′,	Deichmann	6	9,8	1,7	5,77
Pâkitsoq	69°27′,	J. Vahl	6	11,0	1,9	5,92
Diskofjord	69°27′,	M. P. Porsild	10	13,8	2,3	6,00
Kangerdluarssuk	67°58′,	E. Porsild	10	10,4	1,7	6,02
Diskofjord	69°29′,	M. P. Porsild	10	16,0	2,3	6,09
Uvkusigssat	72°18′,	K. J. V. Steenstrup	6	11,8	1,3	6,21
Isortoq	67°10′,	J. Vahl	7	13,1	2,1	6,24
Laksefjord	72°31′,	Th. & M. P. Porsild	10	14,6	2,3	6,27
Skansen	69°25′,	M. P. Porsild	10	11,7	1,8	6,36
Ikertôq	66°45′,	J. Vahl	7	13,0	2,0	6,50
Jakobshavn	69°13′,	Engell	6	13,2	2,0	6,60
Holsteinsborg	66°56′,	J. Vahl	5	13,5	2,0	6,75
Akúnâq	68°48′,	M. P. Porsild	10	10,3	1,5	6,75
Godthaab	64°11′,	J. Vahl	7	17,0	2,5	6,80
Torssukátak	69°55′,	Sylow	7	13,4	1,9	7,02
Ũmánatsiaq	70°35′,	J. Vahl	7	12,0	1,7	7,06

	N	L	b	l/b
Godthaab ..... 64°11′, Rosenvinge	6	11,7	1,6	7,31
Laksefjord ..... 72°30′, Th. & M. P. Porsild	10	20,6	2,8	7,42
Laksefjord ..... 72°30′, Th. & M. P. Porsild	6	15,0	2,0	7,50
Ungôriarfik .... 67°42′, A. Kornerup	6	11,0	1,5	7,50
Godthaab ..... 64°11′, Rosenvinge	7	10,9	1,4	7,79
Jakobshavn .... 69°13′, J. Vahl	5	10,3	1,3	7,92
Qarajaq .... 70°30′, Vanhöffen	7	12,0	1,5	8,00
Bjørnesund .... 63°0′ , Kornerup	6	17,7	2,2	8,05
Sermilik .... 65°33′, S. Hansen	8	13,3	1,6	8,31
Christianshaab . 68°49′, Warming & Holm .	6	10,4	1,2	8,67
Qugssuk ...... 64°32′, Holbøll	10	10,5	1,2	8,75
Christianshaab . 68°33′, M. Mathiesen	6	13,0	1,4	9,30
Ũmánaq .... 70°40′, Lundager	6	16,1	1,7	9,47
Ikertôq .... 66°58′, E. & M. P. Porsild .	10	11,3	1,1	10,00
Sermerssuit .... 65°35′, Warming & Holm .	5	13,5	1,3	10,00
Diskofjord ..... 69°35′, M. P. Porsild	10	16,6	1,6	10,54
Laksefjord ..... 72°03′, Th. & M. P. Porsild	10	13,1	1,3	10,69
Average of 290 measurements on 40 specimens:		**12,79**	**1,85**	**6,91**

II. *Ledum decumbens.*

Arctic America and Siberia.

	N	L	b	l/b
Arct. America, Lyon Inlet, Parry	6	9,1	1,8	5,06
Siberia, Pitlekaj, Kjellman	6	8,4	1,3	6,46
Labrador, Hopedale, R. F. Hohenacker ...	8	14,5	2,2	6,60
Arct. America, King Point, G. Hansen	6	12,3	1,8	6,83
Siberia, St. Lawrence Bay, Kjellman	5	9,2	1,3	7,07
Siberia, Boganida, Middendorff	8	14,7	2,0	7,35
Arct. America, Hudson Bay, J. M. Macoun	6	15,3	1,9	7,85
Labrador, Turnavik, J. M. Macoun	6	14,4	1,8	8,00
Labrador, Rigolet, Geol. Survey	5	15,6	1,7	9,18
Siberia, Kamschatka, Rieder	5	19,5	1,8	10,82
Siberia, Amur Land, F. Karo (Determination doubtful)	7	24,0	1,8	13,33
Average of 68 measurements on 11 specimens		**14,41**	**1,80**	**8,03**

III. *Ledum groenlandicum.*

South Greenland.

			N	L	b	l/b
Ũmánaq.......	64°29′,	S. Hansen........	5	16,5	10,6	1,56
Sermersôq.....	60°27′,	A. Jensen........	5	11,8	6,8	1,74
Kuánerssôq....	62°	N. Hartz.........	10	13,6	6,8	2,00
Julianehaab ...	60°43′,	G. Meldorf	10	15,4	7,2	2,14
Tiningnertôq...	62°20′,	Kornerup........	5	13,4	5,9	2,24
Neriaq........	61°35′,	N. Hartz.........	5	18,5	8,2	2,26
Kobbefjord....	64°08′,	Warming & Holm.	7	22,2	9,8	2,30
Nunatarssuaq..	64°30′,	J. Vahl..........	10	13,0	5,6	2,32
Nunarssúnguaq	64°30′,	J. Vahl..........	5	24,7	10,3	2,40
Ivigtût........	61°13′,	G. Meldorf	10	14,6	5,9	2,47
Ivigtût........	61°12′,	Lindhard.........	10	14,0	5,6	2,49
Sermilik.......	65°33′,	S. Hansen........	6	32,5	12,9	2,52
East Grld. Chr. 4. Ø........	60°00′,	Sylow...........	10	19,4	7,6	2,53
Ilua..........	59°55′,	Sylow...........	7	20,7	8,0	2,59
Julianehaab ...	60°43′,	G. Meldorf	10	18,4	6,9	2,67
Qeqertalik.....	66°44′,	E. & P. M. Porsild.	10	25,5	9,5	2,70
Kobbefjord....	64°08′,	Warming & Holm.	7	10,6	3,9	2,70
Ivigtût........	61°13′,	Lindhard.........	10	14,4	5,2	2,70
Kapisilik......	64°26′,	J. Vahl..........	10	22,0	8,1	2,72
Godthaab Fjord	64°25′,	Nygaard.........	10	24,1	8,7	2,77
Greenland.....		Hb. Hornemann ..	5	26,6	9,6	2,78
Kuánersôq	ca.62°,	N. Hartz	10	20,5	7,1	2,89
Greenland.....		Giesecke.........	5	30,9	10,4	2,98
(»Egedesminde«?)	68°42′,	H. P. Sørensen....	5	17,2	5,7	3,02
Kuánersôq	ca.62°,	N. Hartz	10	16,1	5,3	3,04
Baals Revier ..	64°30′,	J. Vahl..........	5	32,4	10,0	3,24
Tasermiut.....	60° 5′,	J. Vahl..........	7	15,9	4,9	3,25
Greenland.....	,	Wormskiold......	5	19,0	5,7	3,33
Godthaab Fjord	64°20′,	Nygaard.........	10	18,5	5,5	3,36
Nunarssúnguaq.	64°30′,	J. Vahl..........	7	26,3	7,8	3,37
Ikertôq Fjord ..	66°45′,	E. & M. P. Porsild	10	17,6	5,6	3,44
Greenland.....		Hb. M. Vahl......	5	19,0	5,1	3,73
Holsteinsborg ..	66°56′,	Lundager........	10	17,2	4,4	3,91
Qugssuk	64°32′,	Holbøll..........	6	20,0	4,8	4,17
Holsteinsborg ..	66°56′,	N. Hartz.........	10	24,1	5,6	4,30
Ikertôq	66°58′,	E. M. & P. Porsild.	10	20,8	4,8	4,33
Baals Revier ..	64°30′,	J. Vahl..........	5	25,7	5,5	4,67
Ikertôq	66°45′,	J. Vahl..........	5	26,4	5,2	5,08

	N	L	b	b/l
Qugssuk ...... 64°32′, J. Vahl	6	19,0	3,3	5,76
Greenland ..... J. Vahl	10	21,3	3,0	7,10
Average of 308 measurements on 40 specimens		**20,04**	**6,31**	**3,18**

IV. *Ledum groenlandicum.*

Boreal America.

	N	L	b	l/b
Canada, Quebec, Mt. Albert, M. L. Fernald	5	14,9	7,4	2,01
New Foundland, St. Johns, Robinson & Schrenk	6	26,2	11,8	2,22
U. S. A., Maine, Langerville, M. L. Fernald	5	23,4	8,0	2,93
— — St. Francis, —	5	28,0	8,6	3,26
[cultivated] Hort. Bot. Jenensis	6	28,3	8,5	3,33
Labrador, Rigolet, Geol. Survey	10	34,7	10,1	3,44
Alaska, Juneau	5	29,6	7,9	3,75
Labrador, Battle Harbor, Geol. Survey....	8	23,5	6,0	3,92
Average of 50 measurements on 8 specimens:		**27,77**	**8,83**	**3,14**

V. *Ledum palustre.*

Boreal Europa.

	N	L	b	l/b
Sweden, Jönköping, Mortensen	5	23,6	4,8	4,92
Lapland, Orlow, Kihlman	5	13,8	2,8	4,93
— Luleå, Duurloo	8	20,6	3,8	5,42
— Bosekop, Warming	5	24,6	4,5	5,47
Germany, Lauenburg, J. Lange	5	34,0	6,0	5,80
Lapland, Bosekop, Warming	6	18,8	3,0	6,27
— Mortensnæs, Nordvi	6	20,3	3,0	6,77
Germany, Brandenburg, Paukert	6	24,1	3,5	6,89
Sweden, Öland, Ostenfeld	5	36,8	5,0	7,36
— Västergötland, Almquist	5	29,6	3,9	7,59
Russia, St. Newski, Koernicke	5	14,9	1,9	7,84
Germany, Brandenburg, A. Lange	6	25,1	3,1	8,10
Sweden, Östergötland, J. Lange	5	30,4	3,7	8,22
— Värmland, Liebmann	5	39,0	4,7	8,30
Finland, Tavastia, Collin	5	37,4	4,5	8,31
Germany, Silesia, Ziesche	5	44,8	5,3	8,45

	N	L	b	b/l
Poland, Niosikop	5	18,1	2,1	8,62
Sweden, Västervik, Liebmann	5	32,0	3,7	8,65
Lapland, Luleå, Deinboll	6	30,0	3,4	8,82
Finland, Åbo, Holmén	10	33,7	3,8	8,87
Poland, Debelowo, Raciborski	5	19,0	2,1	9,05
Lapland, Bosekop, Warming	6	19,9	2,2	9,07
— — Hartman	6	19,6	2,1	9,33
— Sakkabani, Warming	6	20,0	2,1	9,52
Letland, Riga, Buhse	6	31,0	3,2	9,67
Germany, Brandenburg, A. Lange	6	28,5	2,9	9,83
— — J. Lange	5	20,0	1,9	10,52
Austria inferior, Spritzenhofer	5	26,6	2,5	10,64
East Prussia, v. Duisburg	5	43,0	3,7	11,62
Finland, Nyland	6	37,0	3,1	11,93
Sweden, Hartman	5	35,2	2,8	12,57
Russia, White Sea Island, Pohle	10	23,3	1,6	14,56
Average of 184 measurements on 32 specimens:		**27,20**	**3,24**	**8,41**

Results of the investigations.

Summarizing the results of the measurements listed above, we find:

	l	b	l/b
I. *L. decumbens*, Greenland 40 specimens, 290 measurements	7—**12,79**—21	1—**1,85**—3	3—**6,91**—11
II. *L. decumbens*, Arctic America and Siberia 11 specimens, 68 measurements	**14,41**	**1,80**	**8,03**
III. *L. groenlandicum*, South Greenland 40 specimens, 308 measurements	11—**20,04**—35	3—**6,31**—13	1,5—**3,18**—7
IV. *L. groenlandicum*, Boreal America, 8 specimens, 50 measurements	**27,77**	**8,83**	**3,14**
V. *L. palustre*, Boreal Europe 32 specimens, 184 measurements	15—**27,30**—45	1,5—**3,24**—6	5—**8,41**—15

By comparing the lists **I** and **III** we see that the two Greenland species of *Ledum* in the great majority of cases will easily be distinguished by the shape of the leaves alone, *L. groenlandicum* being — as was known before — a more broad-leaved form. However, we must admit that in some cases the lists overlap, i. e. there

exist some rather narrow-leaved specimens of *L. groenlandicum* and some broad-leaved ones of *L. decumbens*. In those cases, however, the absolute size of the leaves will be decisive as *L. groenlandicum* is moreover a more large-leaved form.

By comparing the lists **I** and **II** we see that the scanty material of *L. decumbens* from Arctic America and Siberia agrees very well with the large one investigated from Greenland. The size and the shape of the leaves are nearly the same. And by comparing the lists **III** and **IV**, it will be seen that *L. groenlandicum* from Boreal America has somewhat larger leaves than the Greenland specimens, but the shape is the same. The American plants belong to the same stock, but where growing under more favourable circumstances, they are better developed.

The next question is: Can the plant here called *L. decumbens* by the size and shape of the leaves be distinguished from *L. palustre* of Boreal Europe? By comparing the lists **I** and **II** with **V** we see, that as to the size there is a wide difference: the leaves of *L. palustre* are on an average twice as long as those of *L. decumbens*. As to shape there seems to be a slight difference too: the leaves of *L. palustre* are also relatively somewhat longer than those of *L. decumbens*, (Comp. **I** and **V**). But as the leaves of plants ranging from boreal zones into the arctic ordinarily become smaller, the size of the leaves alone would hardly suffice to establish an independent species.

According to our experience gleaned from the various parts of West Greenland, *L. decumbens* also varies, according to the conditions of the habitat, developing rather large leaves in favourable situations. Numerous examples will be found in the list **I**. And, on the other hand, it will be evident from examples in the list **V** that also *L. palustre*, under unfavourable conditions, varies inversely, leaves growing smaller. However, even under extreme conditions, the two species will retain a certain habit of their own, hardly to be described. After having closed my investigation of the whole material I should easily at a glance be able to match the different mounted specimens of *L. decumbens* and *L. palustre* without reading their labels.

What is f. *dilatata* Wahl?

In his *Flora Lapponica* Wahlenberg mentions under *Ledum palustre* a β *dilatatum*: "foliis oblongo-ovalibus." Of this form I have seen the following specimens:

	N	l	b	l/b
Sweden, Falun, Hartman	6	27	7.6	3.55
Japan, Nippon, Tchechonoski	5	27.5	6.0	4.58
Lapland, Karesuando, Lästadius	6	40.0	5.8	6.90

The specimen of LÄSTADIUS was, as seen by the label, sent to some correspondent at Copenhagen to have it compared with *L. groenlandicum.* It does not indeed, belong to this species. It seems to me — as it seemed to LÄSTADIUS, according to remarks on his label — a mere ecological form, occurring now and then, and hardly inheritable.

Also from America a *L. palustre* var. *dilatata* Wahl. is mentioned in literature. I have not seen this plant. Having not seen any genuine *L. palustre* from America, but only *L. decumbens*, I doubt the occurence of the former species in America, and the American var. *dilatata* would thus have to be considered an analogous ecological form of *L. decumbens.*

Another form seen in the Herb. Haun. is var. *longifolia* Freyn, collected in Amur Land, Siberia by Karo. A measurement of 6 leaves gave

l: 43.7; **b**: 3.5; **l**/**b**: 12.48.

Also this form will hardly be constant, and some of the specimens listed in V might just as well be called *longifolia.*

A new distinguishing character for *L. decumbens.*

As is well-known, the inflorescences of *Ledum* are terminal umbel-like clusters and the capsules are 5 celled, dehiscent from the base. In accordance with this fact, the capsules during ripening are downwards bent. There are some differences between the species in the number of flowers, *L. palustre* having the richest, *L. decumbens* the poorest inflorescences. Also the size of the flowers and capsules is largest in *L. palustre*, slightly smaller in *L. groenlandicum* and considerably smaller in *L. decumbens.* But most characteristic is the curvature in the peduncles of the ripe or hibernated capsules. In *L. groenlandicum* the curvature is even through the whole lenght of the peduncle. In *L. palustre* the curvature is nearly the same, the basal part of the peduncle being, however, often somewhat straightish. But in *L. decumbens* the peduncle itself is not curved or only very slightly, whereas the capsule is abruptly downwards bent at the very top of the peduncle, also seen by ABROMEIT, p. 59. This difference in the curvature gives the whole inflorescence in the fruiting state a very conspicuous appearance.

Perhaps it might be objected that this curvature of the peduncles would be dependent on climatic conditions and therefore of no more distinguishing value than the small leaves etc. of *L. decumbens.* One might probably think that the shortness of the arctic summer would not permit an even curving of the peduncle whilst its tissues are yet unsclerified and that the abrupt bending of the capsule is due to the abrupt setting-in of the frosts in fall. But against that objection it

may be urged, that 1) this character marks all fruiting specimens seen from Greenland, also those growing 4 degrees of latitude south of the northern limit of *L. groenlandicum;* 2) that I did not find it on any specimen of *L. palustre* from unfavourable habitats; and 3) that specimens of *L. groenlandicum*, whose genuineness was proved by other characters, growing with *L. decumbens* near the northern limit of *L. groenlandicum* showed no tendencies to such an abrupt hooking of the peduncles.

The morphologically basal part of the capsule-valves of *L. palustre* are distinctly outwardly bent. In *L. groenlandicum* no such thing is seen, the outer surface of the valves being symmetrical. In *L. decumbens* the basal parts of the valves are often outwardly curved, but only very slightly or indistinctly.

The distinguishing characters of the 3 species as found by various authors may be summarized as given in the following page.

The Geographical Distribution. (By M. P. P.)

The main points of the distribution of the *Ledum*-species in Greenland was already known to Jens Vahl, and have since been elucidated by Lange and Rosenvinge and I have not much to add.

! 226. **Ledum decumbens** (Ait.) E. & M. P. Porsild nov. comb.

On heath, often on very dry forms of heath, as for instance on tertiary sands. Sometimes in not too moist mossy bogs.

Disko: Common in the gneissic part. Also common in the sandy area on the south coast, here almost exclusively forming the heath. Ascending to at least 700 m. On basaltic ground covered by old and dense vegetation often common, but not occurring in fresh morainic soil. Besides there are, however, rather wide areas of the island especially on its northern and western part, where one may walk for miles without seeing the plant. (P.).

Hare Ø: Occurring, but scarce (P.).

Mainland: On the basaltic part of Nûgssuaq peninsula sporadic like on Disko. On the gneissic part from Torssukátak soutwards, however, continually distributed and common everywhere. In the southern part of the area commoner on the outer coast and on the hills, whilst the more favourable localities in the lowland are mostly occupied by the following species.

According to Rosenvinge very rare south of 64°, but seen by him down to 61°. In the Herb. Haun. we saw no specimens south of 63°. The northern limit in West Greenland is still unknown, but is to be found somewhere north of 74°. Hence a northern type.

Summary of distinguishing characters, stated by various authors.

	Ledum palustre.	*Ledum decumbens*	*Ledum groenlandicum.*
Growth-form	a small, erect, not much branched shrub, up to 1 m	a decumbent, much branched shrub, up to 0,5 m	an erect, not much branched shruh op to 1 m.
leaves' form	linear	narrow linear	oblong
length of leaves, mm	15—**27**—45	7—**13**—21	11—**20**—35
breadth of leaves, mm	1,5—**3**—6	1—**1,75**—3	3—**6**—13
l/b, average	8—9	7—8	2—3
upper surface of leaves	mostly smooth	areolate wrinkled	coarsely areolate wrinkled
floral buds	ovoid	ovoid	subglobose
calyx-teeth	rather long ciliate	short ciliate	short or indistinctly ciliate
stamens	mostly 10	mostly 10	5—7
length of stamens	longer than corolla	longer than corolla	like the corolla
size of capsule, mm	2.5—3.5 × 6—7	2—3.5 × 3—4	3—4 × 4—5
form of capsule	ellipsoid	ovoid or subglobose distinctly smaller and shorter	ellipsoid or subcylindric
style of ripe capsule	thin, as long as the capsule	thick, often shorter than capsule	thin, distinctly longer than capsule
base of ripe capsule-valves	distinctly recurved	indistinctly or not recurved	not recurved
peduncle of ripe capsules.	from a straightish base evenly curved	abruptly bent under the capsule, otherwise nearly straight	evenly arcuated through their whole length
climate of occurrence	boreal, continental, lowland	arctic or alpine, also near the coast	boreal, lowland
geographical range	Northern Eurasia, ? Western N. America	Eastern Arctic Asia, Arctic N. America, W. Greenland	Northern America, Southern Greenland

Abundantly flowering, but the fructification is not good every year. Covered by snow during winter.

Λ 227. **Ledum groenlandicum.** Oed.

On luxuriant not too dry heath, in mossy bogs and at the edges of willow thickets.

Mainland: Near Holsteinsborg, 67°, and in the fjords inland from that place rather common (several collectors).

It has sometimes been reported farther to the north on the mainland and also sometimes from the fjords of Disko. But although we have eagerly searched for it, we never succeded in finding it here. In the Herb. Haun. is a specimen from Egedesminde 68°42′ (Sør.) (see list III), but we doubt the correctness of the statement. We must, until new records have been made, consider the polar circle as its nothern limit in West Greenland.

South of our area it becomes commoner, and it occurs down to the southmost Greenland and reaches to at least 60°10′ on the east coast. Hence a southern type.

Principally a lowland plant. Abundantly flowering and — in the southmost habitats — also abundantly fructificating.

Covered by thick layers of snow during winter.

With the slight exception mentioned above no *Ledum* occurs on the whole coast of East Greenland.

Outside Greenland no *Ledum* is known, neither from Iceland, Jan Mayen, Færøes nor the British Islands. In northern Norway and through the whole of Sweden occurs *L. palustre.* This species is sporadic in the lowland of Germany becoming commoner eastwards, rather continually distributed from Servia through Hungary, Austria, Galicia, Poland, eastern Baltic lands, Fennia to Lapland. Further it is common in temperate and boreal Russia and through the whole of northern Asia to Korea and northern Japan. In its whole area this species is a lowland plant and a continental species avoiding the arctic barrens north of the limit of the forests. Perhaps it enters the American continent in its western boreal part. What we saw from Arctic and Eastern North America belonged to *L. decumbens.*

L. decumbens occupies the Arctic part of Asia, at least to Jenissei. It has sometimes been reported from Arctic Russia and the Kola peninsula. What we saw from the northernmost localities of Europe was depauperate forms of the preceding. On Nova Zemlia and Spitsbergen no species of *Ledum* occurs. Further we consider the *Ledum* occurring in Northern America north of the area of *L. groenlandicum* to be this species. It ranges in the eastern part nearly up to the 70th parallel of latitude

and southwards to New Foundland. By ROBINSON & FERNALD a variety *dilatatum* is stated down to the Mountains of Maine and to the Great Lakes. If we are right, that would be a luxuriant form of *L.decumbens*

L. groenlandicum is a lowland plant ranging through the Boreal parts of the whole North American continent, the American analogon to the Eurasiatic *L. palustre.* Besides Southern Greenland it perhaps also enters the Boreal Northwestern parts of Asia (according to LEDEBOUR).

To Greenland the species of *Ledum* immigrated in postglacial time. *L. decumbens* probably came from the North, over Smith' Sound. Its area in West Greenland is now widely separated from its main distribution in Arctic America, and therefore the immigration probably took place during the milder climate of an interglacial period. A much larger gap separates the Greenland stock of *L. groenlandicum* from its continual American area. It is one of the numerous representatives of the Boreal American Forest-Flora occurring in Southern Greenland, the immigration of which to Greenland is still totally enigmatic.

i 228. **Rhododendron lapponicum** (L.) WAHL.

In rather dry heath and on rock shelves.

Very common throughout the whole area.

Widely distributed in Greenland, without southern limit, in the southern parts however scarcer (Ros.); the northern limit not known, but is to be searched for north of 76°.

Ranging from the shore line to considerable altitudes.

Early flowering and abundantly fructificating.

Not much varying; ordinarily prostrate, in the southern parts in sheltered positions forms like erect shrubs or dwarf trees occur.

Covered by snow during winter, but not by thick layers.

i 229. **Loiseleuria procumbens** (L.) DESV.

On sunny spots in heath, on cliffs, sometimes on fell-fields.

Common throughout the gneissic parts, scarce on basalt, often absent over wide areas here. (Comp. *Ledum.*)

Widely distributed in West Greenland without southern limit; the northern limit still unknown, in East Greenland not north of 67°16′.

Ascends to great altitudes.

Abundantly flowering and fruiting.

Normally covered by snow during winter.

i 230. **Phyllodoce coerulea** (L.) Bab. *Bryanthus taxifolius Gray).*

In herb-mats and luxuriant sheltered heath.

Disko: Common on the south coast and in Diskofjord as well as on the northern shore of Mellemfjord. Also occurring north of Nordfjord, but scarce. Not observed on the Waygat-coast, nor in the big valleys leading to the heads of the northernmost fjords (P.).

Mainland: Rather scarce and restricted to favourable spots in the northern parts, becoming commoner southwards and at greater distance from the shore (P.).

Widely distributed in West Greenland, without southern limit; the northern limit somewhere north of 74°.

In the area mostly a lowland plant.

Abundantly flowering and fructificating.

Covered by thick layers of snow, often occurring on spots with long lasting snow-patches.

XXXIV. Ericaceae.

V 231. **Cassiope tetragona** (L.) Don.

In heath and not too wet bogs. Also in fell-fields up to the borders of the snow fields.

Very common throughout the whole area.

Widely distributed in West Greenland without northern limit. The southern limit is about 64° where the plant only occurs in alpine inland stations. Already in the fjords between 66°—67° scarcer on the sunny slopes than on the northern; observed, however, locally down to the shore. A northern type.

Flowers and fructificates abundantly, the fruits ripen under the snow; and the seeds are not dispersed till the following spring.

This heather attains its most vigorous growth on sunny, well drained spots with abundant watering during the vegetative season. Next to *Empetrum* the most characterizing shrub in the heath. Like this it is collected in large quantities for fuel. Owing to its highly resinous contents it will burn in flames, even in a wet state.

Normally covered by thick layers of snow, in the highlands sometimes also snowless.

i 232. **Harrimanella hypnoides** (L.) Coville. Proc. Wash. Ac. Sc. III. 1901. p. 575 (*Cassiope hypnoides* (L.) Don.).

On spots with long lasting snow, nearly always together with *Salix herbacea.*

Common throughout the whole area. In the big fjords of the southern part, however, rather scarce in the lowland, commoner on elevated stations or on the northern slopes.

Widely distributed throughout the whole area, without southern limit; the northern limit not yet known, but will be north of 74°.

Abundantly flowering and fructificating.

Covered by thick layers of snow during winter.

Andromeda polifolia L. was reported from Disko by Taylor and Hart, but according to Simmons (Medd. om Grl. 26. p. 472) no plants verify these statements. Otherwise in Greenland only observed once somewhat north of 62°.

⊥ 233. **Arctostaphylos Uva Ursi** (L.) Spreng.

On luxuriant and sunny spots in the heath.

Mainland: Only observed in the fjords inland from Holsteinsborg: Maligiaq and Itivneq, about 67° (V. W. & H. P. & E.), Ikertôq, 66°47′ (V.) Aussivik at the head of Itivdleq-fjord, 66°31′ (P. & E.).

A distinct southern type, otherwise not known from Greenland.

The specimens are very stout, abundantly flowering and fructificating.

Covered by snow in winter.

Λ 234. **Arctostaphylos alpina** (L.) Spreng.

In small isolated patches amongst other Ericaceae in the heath. Rare.

Disko: A small occurrence, only a few meters in diameter near the village Sioraq in Disko-Fjord, 69°28′, well known by the natives who present it as a curiosity to travellers. For the first time brought home by L. Kumlien, later by Traustedt, Sørensen and Porsild (several times). A similar patch east of the cliff Skansen (Ivnarssuit) 69°20′ on the south coast, even here detected by the natives (P.).

Mainland: On the islet Qeqertaq at Torssukátak icefjord, ca. 70°, detected by Berggren, refound by E. P.

In West Greenland a rare southern type although it ranges farther north in other countries. South of our area only found a few times about 65°. Also occurring in the Scoresby-Sound region in East Greenland.

Abundantly flowering and fructificating. The berries are black, when ripe.

Covered by snow during winter.

XXXV. Vacciniaceae.

I 235. **Myrtillus uliginosa** (L.) Drej. var. **microphylla** Lange.

On heath-land, cliffs and barrens.

Very common throughout the area.

The widest distributed shrub in Greenland, horizontally as well as vertically, without southern or northern limits.

Abundantly flowering and fructificating.

Often snow-less during winter.

Locally, on favourable spots, especially on sunny rock-ledges or in clefts with sufficient moisture in summer, a stouter, tall-leaved form: var. **pubescens** (Horn) Lange occurs. It is always covered by thick layers of snow in winter and late flowering, whereas var. *microphyllum* is early flowering (Conf. Porsild: Medd. om Grønl. 50. p. 381 fig. 14 and p. 362 fig. 9). Perhaps there is a certain connection between the late flowering and the snow covering. Another direct effect may be that his form, at least in the northern parts of the area, but seldom or never fructificates.

The berries of var. *microphylla* are very juicy and palatable and are much coveted by Europeans in Greenland. Also the natives do collect and eat them, but not to the same extent as those of *Empetrum*, principally because they ripen before the frosts set in and are impossible to keep in the natural state.

Λ 236. **Vaccinium Vitis Idaea** L. var. **minus** Lodd. (Syn. v. *pumilum* Horn).

On luxuriant heath and not too wet mossbogs.

Disko: Very rare, near Godhavn, 69°15′, on a single spot, hardly 10 m in diameter between Lyngmarken and Østerdal (E. P.). "Disko", special locality not mentioned, found by Margrete Krarup Smith, perhaps from the same spot. South coast at Igpik, 69°18′ and Kûgssuaq, 69°20′, on both places only a few specimens (P.). — Diskofjord, according to the natives the plant is said to grow somewhere near the mouth of the fjord, but nobody knows the locality now.

Mainland: Jakobshavn, 69°13′ (Pfaff.). South of the Icefjord rather common, especially in the Sydostbugt (P.). Also common on the islands around and south of Egedesminde as well as in the fjords on those latitudes (P.). Very common in Nordre Strømfjord and in the fjords inland from Holsteinsborg (P. & E.).

A southern type principally occurring in the middle parts of the west coast. In the southernmost parts of Greenland the occurrences are scarce. North of our area the plant has several times been reported in the literature, right to 76°, but all the reports want confirming and until then Disko has to be considered the northern limit.

The var. *minus* Lodd. is at the same time a western type, widely

ranging in North America and Eastern Greenland. On Iceland the European form occurs.

Flowers abundantly. The occurrence at Godhavn has been carefully observed through half a dozen years, but it never fruited. About the Sydostbugt great quantities of berries are, as a rule, collected every year for sale to European households around Disko Bay. The fruits are, however, sometimes so scarce that it does not pay to collect them. Thus principally after winters rich in snow and cold springs. About Egedesminde the berries do ripen, but not in such quantities that it will pay to collect them. Around Igíniarfik in the Ataneq-fjord, 68°70′ berries are collected every year for local demand, and more could easily be supplied if the conditions of transport to other places were better. The natives do not collect the berries for themselves as they cannot afford the extra sugar which is needed to make them palatable. By Danish housekeepers the berries are considered much better than introduced Danish or Norwegian berries.

Oxycoccus palustris Pers.

was reported from Hunde Ejland, 68°52′ (Sør.) and the specimen exists in H. H. Otherwise the plant is found several times between 60° and 62° and from the Godthaab-fjord-region, 64°. On Hunde Ejland it has been searched for several times, by Kruuse as well as by us, but in vain, and as the island is but small and the suitable localities easily surveyed, we are inclined to suppose that the statement is due to confusing of material.

XXXVI. Diapensiaceae.

237. Diapensia lapponica L.

On open sunny spots in heath and barrens.

Disko: Common in the gneissic parts, scarce in the basaltic and absent in the northern parts of the island, also in the luxuriant valleys leading into the interior.

Mainland: Common on gneissic rock throughout the area, however, scarcer in the lowland around the big fjords of the southern part.

Widely distributed in West Greenland, without southern limit, the northern limit is still unknown, but may be searched for north of 74°.

Ascending to high altitudes.

Abundantly flowering and fructificating.

Normally covered by snow during winter, but sometimes snow-bare tufts are found.

XXXVII. Plumbaginaceae.

I 238. **Statice maritima** (L.) MILL. var. **sibirica** (TURCZ.) SIMM.

On heath and barrens, lake shores and sometimes near the sea.

Disko: Common everywhere up to at least 800 m.
Hare Ø (P.).
Mainland: Around Disko Bay common; archipelago around Egedesminde scarce (K. P. & E.) Nordre Strømfjord scarce, principally on the northern slopes and on the hills (P. & E); in the fjords inland from Holsteinsborg not common (P. & E.).

Widely distributed in West Greenland without northern or southern limit.

Often occurring near the brackish water, but is not restricted to the sea shore.

Abundantly flowering and fructificating.

Normally covered by snow during winter.

XXXVIII. Primulaceae.

Λ 239. **Primula mistassinica** MICHX.

On saline meadows and raised marine clays.

Mainland: Atâ at the Waygat, 70°16′ (Rink, re-found 1908 by P., that year forming wide patches. On the very same spot scarched in vain 1913 (P.). From here not known till Itivneq, 67°; the var. *groenlandica* WARM. (W. & H., P. & E.); Naujarssuit in Qeqertalik fjord, 66°45′ (P. & E.); on the portage between Itivdleq fjord and Søndre Strømfjord, 66°29′ (P. & E.); Umîvik at the head of Søndre Strømfjord (Jens.).

A southern type without continuous distribution in West Greenland. North of the area collected several times in the North-East Bay where the northern limit is at 70°40′, south of our area known from 64° and 60—61°.

Abundantly flowering and fructificating.

Covered by snow and ice during winter.

The variety described by WARMING (Bih. K. Sv. Vet. Ak. Handl. XII. p. 21. LANGE: Conspectus Tillæg p. 260 was found again by us on the type locality. Here the main form was absent, and we did not find any transitions.

XXXIX. Gentianaceae.

Λ 240. **Gentiana nivalis** L.

In luxuriant herb-mats.

Disko: near Godhavn, 69°15′: Engelskmandens Havn near the springs (Rikli, Th. P.), at Torskenæs (Th. P.) and near the springs in Østerdalen (Th. P.).

Mainland: Nordre Strømfjord at Eqaluarssuit, 67° 35′, on both shores (E. P.). South of Sarfarssuaq, 67°45′ (P. & E.) portage near Sarfarssuaq (Korn.); Holsteinsborg: Præstefjæld, 66°55′ (W. & H.).

A distinct southern type, south of our area only observed a few times, common however, south of 61°15′ (Ros.). Probably often overlooked because of its diminutiveness. It is hardly observable amongst other vegetation except when the flowers are expanded in bright sunshine. The localities mentioned above are the northern limit.

Abundantly flowering and fructificating.

The habitats of the plant are covered by thick layers of snow during winter.

⊥ 241. **Gentiana detonsa** Rottb. Københ. Selsk. Skr. p. 435. tab. I fig. 3. 1770. (*G. serrata* Gunn. Fl. Norv. 2. p. 101. 1772).

Mainland: Only once found at the head of the northern branch of Itivdleqfjord, near the fishing place Aussivik, 66°31′, amongst isolated willow bushes near the shore, scarce (P. & E.).

A distinct southern and rare type, otherwise in Greenland only found around Igaliko. In contradistinction to other species of *Gentiana*, *G. detonsa* is large flowering and very conspicuous, and therefore it cannot be overlooked.

The specimens were flowering and fructificating.

The habitat will be covered by snow during winter.

⊥ 242. **Gentiana aurea** L.

Disko: Found in 1898 at the edge of a willow copse at the outflow of a spring, settling crusts of gypsum at 69°33′ N. Lat. 53°34′ W. Long. in Diskofjord (P.); on the same spot re-found several times (P.).

A distinct southern type, rather common at 60°—61°, previously not found north of 61°20′, but without doubt often overlooked.

Abundantly flowering and fructificating.

The habitats are covered by thick layers of snow during winter.

⊥ 243. **Gentiana tenella** Rottb.

Mainland: In herb-mats at Orpigssuit, 68°21′ (Htz.); near the river to the southern branch of Søndre Strømfjord, on several spots, up to 400 m, 66°50′ (Jens.).

The above mentioned localities are hitherto the only known from West Greenland. In East Greenland, however, it was observed much farther to the north. A southern type.

Flowering and fructificating.

Probably the habitat is covered by snow during winter.

Λ 244. **Pleurogyne rotata** (L.) GRISEB.

On sandy clay near the shore as well on raised marine clays.

Mainland: Christianshaab 68°47′ (Rink); Egedesminde 68°45′ (Rink); Tasiussarssuaq, 68°25′ (Bg.); Nordre Strømfjord at Ipiutarssuaq, 67°42′ (P. & E.) and another place (Korn.); Itivneq, 66°55′ (P. & E.); Ikertôq fjord, 66°45′ (V.).

A southern type, south of the area found several times and becoming common between 60—61° (Ros.). The above mentioned localities are the northern limit.

Abundantly flowering and fructificating. In the localities seen by us it formed rather extended patches.

The habitats are covered by snow during winter.

⊥ 245. **Menyanthes trifoliata** L.

In small lakes.

Mainland: at Tasiussarssuaq, 68°25′ (Bg. Bl.); Nordre Strømfjord, on the portage at Sarfarssuaq 67°50′ (Korn. P. & E.); Ikertôq fjord, 66°45′ (V.).

A distinct southern type. South of our area found several times, but always locally.

Our specimens were partially deflowered August 6. 1918, an unfavourably year. Ripe or wintered fruits were not observed. ROSENVINGE reports only of unripe fruits from the southmost Greenland and in the H. H. all specimens from Greenland are without fruits, whereas the plant fructificates in Iceland.

During winter the lakes will freeze to the bottom and the plants are covered by or enclosed in ice.

XL. Borraginaceae.

! 246. **Mertensia maritima** (L.) GRAY.

On sandy sea shore, hence sometimes in manured soil at some distance from the shore.

Disko and Hare Ø very common (P.).

Mainland: Common in the basaltic and sand stone districts, scarce in the gneissic, because suitable localities are restricted and local. Also observed in Nordre Strømfjord, at the mouth as well as at the head (P. & E.).

Its range in Greenland is rather remarkable and resembles that of the northern types, although the plant on both sides of the Atlantic occurs down to the shores of temperate regions. South of our area it is known in West Greenland only from two spots, viz. at 65°20′ and 63° and in the whole of East Greenland it was only found in 3 specimens near the settlement of Angmagssalik 65°37′ (K.) perhaps here as an

introduced weed. On the other hand it is common in Iceland and Jan-Mayen. The northern limit in Greenland is still unknown, but may be north of 76°.

On Disko abundantly flowering and fructificating and seedlings are found everywhere. The achenes have an air-chamber and will float a long time.

Covered by snow during winter.

XLI. Labiatae.

⊥ 247. **Thymus Serpyllum** L. var. **prostratus** HORN.

In sandy soil amongst willows and grasses.

Mainland: Only found in the southern part of the area at Præstefjæld near Holsteinsborg 66°55′ (Giesecke, W. & H., P. & E.), the northern limit.

A distinct southern type, south of the area observed at 65°10′ common about 64° and from 62° to 60°.

Our specimens were quite sterile Aug. 6. 1914, an unfavourable year. Specimens from South Greenland are abundantly flowering and will, at least in good summers, develop fruits.

Covered by snow during winter.

XLII. Scrophulariaceae.

Λ 248. **Veronica alpina** L. var. **unalaschkensis** CH. & SCHL. (Syn. *V. villosa* Wormskj. mscr., *V. Wormskjoldii* ROEM. & SCHULT., *V. alpina* var. *villosa* LANGE).

In herb-mats and willow-thickets.

Disko: South coast and Disko fjord common; Mellemfjord, northern side scarce; Nordfjord near the mouth and west coast several localities up to 70°11′; coast towards Waygat scarce to 69°50′ (P.).

Hare Ø: South coast scarce (P.).

Mainland: Near the settlement of Nûgssuaq, 70°41′, along the Waygat very scarce, becoming commoner in the gneissic districts south of Torssukátak ice-fjord and southwards, but nowhere continually distributed. For instance rare in the Archipelago of Egedesminde and surprisingly scarce in the inner parts of Nordre Strømfjord (P. & E.).

A southern type hitherto not observed north of the localities mentioned above. In our area principally a lowland plant.

Abundantly flowering and usually also fructificating.

Covered by thick layers of snow during winter. Often the snow will last long in spring.

White flowered specimens are not infrequent.

Λ 249. **Veronica fruticans** Crantz. (*V. saxatilis* L. fil.).

On similar spots as the preceding, but much rarer.

Disko: South Coast near Godhavn, 69°15′, several localities (P.), Brede Dal, 69°18′ (Nygaard!).

Mainland: Atá, 70°17′, Atanikerdluk, 70°2′ (Stein) S. Kangerdluarssuk 67° (W. & H.), Præstefjæld near Holsteinsborg, 66°55′ (W. & H., P. & E.) and probably in more localities. Lange: Conspectus gives no special occurrences for that much rarer species.

A southern type, common in the southernmost Greenland; the above mentioned localities are the northern limit in West Greenland.

Flowering late, but rather richly, also fructificating in good seasons.

Covered by snow during winter, but only occurring where the snow layers disappear early in spring.

White flowered specimens are common.

Λ 250. **Bartschia alpina** L.

In herb-mats and thickets.

Disko: Ranging over the whole southern part of the island, on the east side to 70° and the west to north of Nordfjord, common in the south, scarcer northwards (P.).

Mainland: In the interior of Nûgssuaq peninsula (P.). From the Waygat coast at 70°15′ southwards, common in the districts east of Disko Bay, scarce in the archipelago of Egedesminde, common in the fjords inland from that latitude and gradually becoming commoner towards the southern limit of our area (P.).

A southern type observed, however, a few times north of our area up to 72°4′ (P.). In our area a lowland plant.

Abundantly flowering and fructificating. Covered by thick layers of snow, but early snowbare in spring.

Λ 251. **Euphrasia arctica** Lange Bot. Tidskr. I. 4. p. 47 (*E. latifolia* Pursh Conf. Rosenvinge Medd. om Grl. 15. p. 68. Robinson & Fernald: Gray's Manual 7. ed. p. 733).

In sunny and luxuriant herb-mats and open willow-thickets. Ordinarily only a few centimetres high and probably often overlooked.

Disko: South Coast and Disko-fjord rather common, especially near the hot springs.

Mainland: Kingigtoq, 70°8′ (Htz. From Torssukátak along the eastern side of Disko Bay rather common to Tasiussarssuaq (P.), not observed in the archipelago of Egedesminde (K., P. & E.), common in N. Strømfjord (P. & E.) as well as in the fjords inland from Holsteinsborg (P. & E.).

A southern type without southern limit, north of our area observed a few times in the North-East-Bay up to 71°25′ (P.), its known northern limit in West Greenland. In our area a lowland plant.

Abundantly flowering and fructificating, even specimens only 1 cm high will flower.

The habitats of the plant are richly covered by snow during winter.

252. **Pedicularis lapponica** L.

On heath and mossy bogs. Common or very common throughout our area, but never occurring in mineralic soil poor in humus.

The distribution of this species in Greenland is remarkable: south of our area it is common to about 64° and only observed twice south of that latitude (Ros.). In East Greenland it is only known between 69°25′ and 73°10′ (K.) The northern limit in West Greenland is still unknown, in the fjords at 72°23′ it was so commonly distributed that the northern limit hardly can be here. On the other hand the records from 76°—83° by HART have proved to be erroneous (SIMMONS: Ellesmereland p. 34).

In our area ranging to at least 600 m above the sea.

Abundantly flowering, but very often no seeds are developed.

Covered by thick layers of snow during winter.

253. **Pedicularis euphrasioides** STEPH.

On somewhat humid, luxuriant heath, exceptionally observed on a gravelly slope.

[Disko: Stated from Diskofjord, without special mention of locality (Sør.). Here scarched for in vain through several years especially at the settlements visited in all probability by the Rev. Sørensen (P.).]

Mainland: Continually distributed from the South-East-Bay (the northern limit at 68°45′) at least to S. Strømfjord, 66°30′. This large occurrence borders on the inland ice and the species does not occur in the archipelago of Egedesminde (K., P. & E.). In the fjords, N. Strømfjord and N. Isortoq, the occurrence advances towards the mouth.

A southern type the range of which in Greenland is very remarkable. Besides from the occurrence mentioned above it is known from the fjords about 64° and from an isolated finding at 62°5′ (Ros.). Not found in East Greenland.

Very abundantly flowering and fructificating.

Covered by thick layers of snow during winter.

The species is perennial.

254. **Pedicularis flammea** L. (*P. versicolor* MEEHAN, not WAHL.).

In mossy bogs and moist places in the heath.

Very common throughout the whole area.

Widely distributed in Greenland, without southern limit; the northern limit not known, but may be north of 74°.

Occurring from the coast to at least 700 m.

Abundantly flowering and fructificating.

Covered by snow during winter.

V **255. Pedicularis hirsuta** L.

On heath, gravelly barrens, seldom on open spots in bogs.

Very common throughout the whole area.

Widely distributed northern type, without northern limit, on the west coast not found S. of 64°.

Ranging from the sea shore up as far as ice-free land is found.

Abundantly flowering and fructificating.

Often without cover of snow during winter. The flowers are pinkish, often whitish.

V **256. Pedicularis lanata** (WILLD.) CHAM. & SCHLECHT.

In poor and open heath, often in gravelly barrens far away from other plants. When growing amongst other plants, however, the roots also of this species are provided with *haustoria*.

Very common in the northern part of the area, becoming scarcer south of Disko Bay. In N. Strømfjord it is restricted to alpine stations and northern slopes and rather scarce (P. & E). South of Holsteinborg observed several times down to Itivdlínguaq, 66°30′ (P. & E.).

A northern type, without limit northwards; the above mentioned is hitherto the southmost known in West Greenland. Not found in East Greenland, the record from 66°5′ by KRUUSE is erroneous. (P.).

Abundantly flowering and fructificating. The flowers are purplish-crimson, white forms are very rare. At the same locality flowering 1—2 weeks before the preceding. The large, strongly yellow-coloured roots are sometimes eaten by the natives. They have a sweet taste (from dulcite?).

Often snowless during winter.

XLIII. Lentibulariaceae.

Utricularia.

Like the species of *Callitriche* the *Utricularia*'s found in Greenland occur near the shores of small shallow lakes, but they are much rarer. During winter those lakes are frozen right down to the bottom, but they melt rather early at the shores, and in the summer the water here is warm. The hibernacula will grow out to small shoots, but because of the short summer they never attain to flowering. Like most of the

Potamogeton's of Greenland, their life-cycle is a continued development of hibernacula. All are distinct southern types.

⊥ 257. **Utricularia ochroleuca** HARTM.

Mainland: Orpigssuit, 68°40′ (Htz.) (Perhaps also the specimens named under *U. minor* from Tasiussarssuaq may belong to this species). — Otherwise only found at Ikerasak 70°30′ (Vh.).

⊥ 258. **Utricularia intermedia** HAYNE.

New to Greenland!

Mainland: In a small lake north of the great rapids Sarfarssuaq in Nordre Strømfjord, 67°50′, we found amongst stems of sedges a mass-growth of an *Utricularia.* Besides the pond was filled with *Menyanthes* and *Hippuris* etc. Although the plants were quite sterile, I have nevertheless determined them to this species, not only because of the dimorphous leaves of which the bladderless ones are provided with numerous dense bristles, but especially on account of the very characteristic leaves of the hibernacula, bearing numerous bristles in bundles (see ABROMEIT Botan. Ergebn. Tab. 8. fig. 28—30).

⊥ 259. **Utricularia minor** L.

Mainland: Brede Bugt north of Jakobshavn, 69°13′ (P.), Claushavn 69°5′ (Bg.), Tasiussarssuaq, 68°25′ (Bg. Bl.).

Λ 260. **Pinguicula vulgaris** L.

In herb-mats and on luxuriant humid spots in heath or open places in moss-bogs.

Disko: South coast, numerous localities around Godhavn and in Disko-fjord (P.).

Mainland: Nûgssuaq peninsula, several localities near the mouth of the big valley (P.), from Paotût, 70°15′ and southwards some localities (P.); east of Disko Bay rather common, especially around the Sydost Bugt (numerous collectors); not seen in the archipelago of Egedesminde (K., P. & E.); several localities in Nordre Strømfjord (P. & E.); rather common in the fjords inland from Holsteinsborg (P. & E.).

A southern type, without southern limit; north of the area found a few times in the North East Bay to about 71°15′ (S. H.), its northern limit in West Greenland.

Richly, but late flowering; in good summers and on favourable spots, ripe fruits are developed, at least on Disko.

Covered by thick layers of snow during winter.

XLIV. Plantaginaceae.

Λ 261—262. **Plantago maritima** L. and **Pl. borealis** Lange.

By several authors for instance A. Blytt: Botan. Notiser 1873 p. 129; James M. Macoun: Contrib. from the Herb. Geol. Surv. Canada XI. (Canad. Rec. Sc. 1897) p. 475 the plant of Lange was considered a valid species, but as stated by L. Kolderup Rosenvinge (Andet Tillæg p. 682) every distinguishing character of the plants from Greenland is variable. Therefore often transitorial forms are met with which by one character may be determined to *maritima*, by another to *borealis*. Therefore the last mentioned author only accepts *Pl. borealis* as a variety of *Pl. maritima*.

Having seen the copious material of Greenland *Plantagos* in Herb. Haun. we cannot but affirm the existence of numerous such forms. Unfortunately we have seen but little of the so-called *Pl. maritima* in the live state in Greenland, as it principally occurs south of our area and nowhere both plants together. Therefore we may leave the question of the specific value of *Pl. borealis* open to future investigations in their natural habitats or to growing experiments. As also admitted by Rosenvinge typically developed specimens differ widely.

Pl. maritima often occurs in South Greenland on the sea shore, but also, according to Rosenvinge in gravelly places at some distance from the shore and ascending to a considerable height. Also in pasture-land at Igaliko he saw it, eaten by cattle. We found it at the head of Nordre Strømfjord, near the shore, but especially on raised marine clays far from the shore. Also in the fjords inland from Holsteinsborg it was rather common. It is several times recorded along the Sydost Bugt, here we only saw *Pl. borealis*. The northernmost record is from the head of Pâkitsoq fjord, 69°30′, here not seen by us.

Pl. borealis grows near the sea shore, ordinarily so close to the sea that it is sprayed by the surf and occurs together with the algal growth (*Ulvaceae*). Also it is met with amongst *Puccinellia*-marshes and stands manuring very well, we never saw it far from the sea or at any height over the sea. It is rather scarce on the south and north-west coast of Disko at the mouth of Nordfjord, but is probably often overlooked. On the Mainland we found it several times from the mouth of the big river on Nûgssuaq peninsula southwards, becoming more common in the gneissic area south of Torssukátak icefjord and especially on the outer coast from the archipelago of Egedesminde southwards. Also at the mouth of Nordre Strømfjord it was common, whilst *Pl. maritima* here was absent, but occurring in the interior. The outer coast near Holsteinsborg was not investigated by us. — The northern-

most locality of this form is north of our area in the Nordost Bugt at 70°47′.

Both forms are southern types, the above mentioned localities their northern limits.

They are abundantly flowering and fructificating.

Covered by snow during winter, *Pl. borealis* also by ice.

Error: The *Plantago* referred to pag. 13 in this paper should be *Pl. borealis; Pl. decipiens* is a species endemic in Eastern Atlantic America, different from our Greenland forms.

XLV. Caprifoliaceae.

⊥ 263. **Linnaea borealis** L.

In open willow thickets.

Disko: On the northern shore of Diskofjord, at 69°33′, found here in 1902 and later several times on the same spot (P.). The plants forms here a wide patch, ordinarily richly flowering.

Mainland: Præstefjæld near Holsteinsborg 66°55′ (W. & H., P. & E.). Both times the plants here were sterile, ours were collected Aug. 1914.

From the locality in Diskofjord I collected live specimens and cultivated them on South Disko. They do not thrive as well as on the natural spots and would be overgrown by other vegetation if left to themselves. As a rule they flower sparingly every year, but neither in culture nor in nature fruits are hitherto found:

A distinct southern type, besides only found twice in the southmost Greenland, at 60°13′ and 61°10′.

Covered by thick layers of snow during winter.

XLVI. Campanulaceae.

V 264. **Campanula uniflora** L.

In herb-mats, on rock-shelves, in open heath and alpine barrens, exceptionally amongst low willows.

Disko: Common, ascending to the limit of vegetation (P.). — Hare Ø (P.).

Mainland: Nûgssuaq peninsule and land east of Disko Bay common (P.). Archipelago of Egedesminde rare (K., P. & E.). Nordre Strømfjord scarce, principally on the northern slopes and on the hills, becoming rare in the interior (P. & E.). District of Holsteinsborg near the outer coast: rare, in the interior only alpine (Jens.).

A northern type, without northern limit. South of our area only observed a few times in alpine situations or descended from the mountains, on barrens.

Abundantly flowering and fructificating. Probably always covered by some snow during winter.

Varying in size, broadness of leaves etc. according to the conditions of the habitat.

i 265. **Campanula rotundifolia** L.

On similar spots as the preceding, but much more common.

Widely distributed in West Greenland, without southern limit, the northern limit may lie between 74° and 76°.

Abundantly flowering and fructificating. Probably always covered by some snow during winter.

Varying very much. Whether the Greenlandic cycle of forms of the collective species *C. rotundifolia* deserve to be united under a special name, *C. Gieseckeana* (Vest.) Witas., I cannot say. On the other hand I am inclined to suppose that the different varieties recorded from Greenland and provided with names are merely ecological forms, connected through numerous transitions. The variety *arctica* of Lange is the normal form, occurring on somewhat favourable spots in our area. On exposed spots the plants are smaller, especially lower, whereas the corolla is as large or even larger, than on the luxuriant form from rock-shelves. On the most barren spots we find a low form also with small flowers: var. *uniflora* Lange.

XLVII. Compositae.

V 266. **Erigeron compositus** Pursh.

On gravelly moraines and barrens, in sandy river-beds and deltas, descended from the highland.

Disko: The northern part of the Waygat coast, common (P.), in the big valleys and on the basaltic plateaus on the Northland (P.), Mellemfjord (Th. Fr.). — Hare Ø (P.).

Mainland: Nûgssuaq peninsula, common in the basaltic and sandstone area, as well near the coast as on the hills and in the big valleys (P.). South hereof not found till Claushavn, 69°5′ (Bg.), Nordre Strømfjord at Eqaluarssuit, 67°36′ (P. & E), N. Isortoq (V.), Holsteinsborg district, near the colony and especially in the interior, where it becomes rather common (P. & E.).

Without doubt a northern type, probably without northern limit. South of our area observed in the fjord-regions at 64° and 60°—61°, probably here descended from the highland.

Abundantly flowering and fructificating.

Often snowless in winter.

Erigeron species Nr. 267 to 268.

For the subsequent species of *Erigeron* we have made Vierhapper's well-known monograph (Beih. Bot. Centralbl. XIX Abt. II H. 3. 1906) and the supplemental observations on the northern and arctic ones by Lindman (Bot. Notiser 1910 p. 161 ff.) the base of our understanding and classification. Vierhapper has for his work made a critical revision of the specimens preserved in most of the larger museums of Europe, amongst them the material from Greenland in the H. H. In the following therefore the remarks on the geographical distribution of the species in West Greenland chiefly rest upon his work or his determinations, whereas we are responsible for the observations on the occurrence of the species on their natural habitat and on their biology, as well as for some details regarding the distribution of the various species occurring near the limits of their range.

! 267. **Erigeron unalaschkensis** (D. C.) Vierh. l. c., Lindman, l. c., *E. uniflorus* Lge. p. p. non L., *E. uniflorus* var. *pulchellus* Fr. Lange et Auctt. Complur de Fl. Groenl., *E. arcticus* Rouy).

In sheltered position: on herb-mats, on spots with long lasting snow.

Disko: Common in the whole of the southern part as well as in the fjords, rather common on the west coast, but scarce on the coast towards Waygat, especially on its northern part (P.). — Hare Ø (P.).

Mainland: Nûgssuaq peninsula common (P.) land east of Disko Bay rather common, becoming scarcer southwards (P.), archipelago of Egedesminde rather common (P. & E.); in the large fjords in the southern part of our area scarce, often only on the northern slopes or near the summits of the hills (P. & E.).

A northern type, south of our area observed in the Godthaab fjord at Ujaragssuit (descended from the high-land?) (S. H.) and from Jensens Nunataq, 62°40′, at the altitude of 4100′ (Korn.), its southern limit. The northern limit is still unknown, but may be somewhere north of 73°. At this parallel the species becomes remarkably scarcer, and from Northern Greenland and Ellesmereland it was not reported by Simmons.

Abundantly flowering and fructificating.

Ascending to considerable attitudes.

Covered by thick layers of snow during winter.

T 268. **Erigeron eriocephalus** J. Vahl. Lindman l. c. (*E. uniflorus* var. or subsp. *eriocephalus*. Vierhapper et Auctt. Compl. sicut Berlin, Rosenvinge, Simmons, Kruuse etc.).

In fresh morainic soil, bare clayey spots in heath, in exposed barrens, sometimes in brook-gravel and deltas, descended from the highland.

Disko: North-east coast, rather common down to about 70° (P.). — Hare Ø (P).
Mainland: Coast of Nûgssuaq peninsula towards the Waygat rather common from 70° to 70°45′ (P.). Holsteinsborg 66°55′ (alpine?) (Htz. affirm. Vierh.).

A high-arctic type, without northern limit, the above mentioned localities are the southern limit of the species in West Greenland.

Flowers earlier than the preceding and fructificates abundantly.

Only covered by scanty layers of snow and perhaps sometimes snowbare in winter.

Where this and the preceding species are found together, e. g. on the coasts of Waygat, the differences in the colouring in the live state are very conspicuous.

Λ 269. **Erigeron uniflorus** L. emend. Vierh.
(*E. alpinus* var. *leucocephalus*, Lange).

When we made our collections, we had no access to the work of Vierhapper and no clear knowledge of this species and its distribution. Therefore some of our field notes from the southern parts of our area, referred to *E. unalaschkensis*, may perhaps belong to *E. uniflorus*. The species is in Greenland, according to the determinations of Vierhapper, a distinct southern type, rather common from the fjords at 64° and southwards. North hereof it has been collected at Qáumarnit Qingua, 65°12′ (Jens.), S. Isortoq, 65°20′ (Ros.) Kangerdluarssugssuaq, 66°17′ (Jens.), and once in Nordre Strømfjord, probably Ungôriarfik, 67°42′ (Korn.). The last mentioned locality is the northern limit and the only one lying within our area.

The specimens in H. H. are flowering and fructificating.

Without doubt covered by snow during winter.

Λ 270. **Erigeron (Trimorpha) borealis** (Vierh.) Simmons.
(*E. alpinus* Lange p. p. *E. neglectus* Auctt. non Kern.
E. alpinus f. *fastigiatus* Ros.).

According to the determinations of Vierhapper, also this species is a distinct southern type with a still more southerly distribution than the preceding. Its main occurrence in West Greenland is south of the 62° parallel. A few specimens are collected in the fjords at 64°, north hereof one specimen from Qáumarnit, 65°12′ (S. H.) and another damaged specimen, which cannot be determined with certainty, from N. Isortoq, 67°10′ (V.). If this specimen were right, it would range within our area.

Several times plants such as "E. alpinus" or "E. neglectus" have been reported from our area, up to 69°30′ on Disko, but according to

Vierhapper, all these identifications are erroneous and are not to be referred to his *E. borealis*.

⊥ 271. **Antennaria groenlandica** Porsild: Medd. om Grl. 51, p. 274 tab. 6. 1915 (Syn. *A. dioica* var. *hyperborea* Lange Consp. Fl. Groenl. p. 100; non *Gnaphalium hyperboreum* Don).

On rather dry spots, sunny herb-mats and heath (Rosenvinge).

Mainland: Only found in the southern part of the area, Holsteinsborg, 66°55′ (V.); with some doubt, I also refer some plants from Ipiutarssuaq in N. Strømfjord, 67°42′ (P. & E.) to this species because of the snow-white obtuse involucral bracts. The rosulated leaves are shorter and relatively broader than on typical specimens.

A distinct southern type, the above mentioned localities are the northern limit. Flowers and fructificates apogamically.

Covered by snow during winter.

Λ 272. **Antennaria intermedia** (Rosenv.) Porsild: l. c. p. 278. fig. 7.

In luxuriant herb-mats and slopes. Rare, probably overlooked.

Disko: Several localities on the South coast near Godhavn 69°15′ (various collectors).

Mainland: Atanikerdluk, 70°5′ (P.); Sarqaq, 70° (V.); N. Strømfjord; Eqaluarssuit, 67°36′ (P. & E.); Præstefjæld near Holsteinsborg, 66°55′ (Th. H.); Naujarssuit in Qeqertalik-fjord 66°44′ (P. & E.).

Probably a southern type, south of our area occurring down to 61°45′.

Abundantly, but late flowering; fruits are developed apogamically in favourable seasons.

Covered by thick layers of snow during winter.

! 273. **Antennaria glabrata** (J. Vahl) E. L. Greene Pittonia III. p. 285. 1898. Porsild l. c. p. 273 fig. 4. (Syn. *A. alpina* var. *glabrata* J. Vahl).

When I in 1915 proposed this combination, I was unaware of the fact that Greene 17 years ago had raised the same plant to the rank of a species.

In herb mats, on open spots in heath and in morainic soil.

Disko: Found in most of the investigated parts of the island, but scarce; without doubt often overlooked. Seems to be somewhat more common on the northern half than on the southern (P.). — Hare Ø (P.).

Mainland: Collected at Nûgssuaq, 70°40′ (P.). Sarqaq, 70° (V. Htz.); Eqe 69°40′ (P.); South coast of Sarqardlît, 68°40′ (P. & E.); N. Isortoq, 67°15′ (V.).

The distribution of this species is still very imperfectly known, hitherto not recorded from the southmost parts of Greenland.

Abundantly flowering and apogamically fructificating.

Covered by snow during winter.

i 274. **Antennaria alpina** (L.) Gaertn., Porsild l. c. p. 269. fig. 3.

In herb-mats, in the lowland often where snow lasts long, also in luxuriant heath or in open thickets, seldom on fresh moraines.

Disko: South coast, the fjords, the west coast and valleys leading into the interior common, on the northern part of the Waygat coast scarce (P.). Hare Ø. (P.).

Mainland: Rather common throughout the whole area, becoming more common southwards (P. & E.).

A widely distributed species without southern limit. The northern limit is not known, but may be north of 76°.

Ranging, from the shore as far up as dense vegetation occurs, but on the latitude of Disko principally restricted to favourable situations.

Abundantly flowering and apogamically fructificating.

Probably always covered by snow during winter.

Λ 275. **Gnaphalium supinum** L.

In herb-mats, undoubtedly often overlooked because of its diminutiveness.

Disko: South coast near Godhavn, 69°15′ (several collectors); Tuaparssuit (P.); Mudderbugt 69°15′ (Htz.).

Mainland: Majorqarssuatsiaq, 70°15′ (Bg.); Ritenbenk and Kangeq, 69°45′ (Bg.); Holsteinsborg, 66°55′ (V.).

A southern type, without southern limit; the above mentioned localities are the northern limit.

In our area a lowland plant.

Abundantly flowering and fructificating.

Covered by thick layers of snow during winter.

The specimens from Disko belong to the var. *subacaule* Wahl, emend. Braun-Blanquet Vierteljahrschr. Naturf. Ges. Zürich. 62. 1917. p. 617.

Λ 276. **Gnaphalium norvegicum** Gunn.

In luxuriant herb-mats and willow-thickets.

Disko: South coast, rather common (P.); Diskofjord, not uncommon, especially on the sunny sides and in the interior (P.); Mellemfjord, at Ikorfarssuit and Sarqardlît silardlît, 69°46′ (P.).

A distinct southern type, on the mainland known to 65°50′ and common south of 64° (Ros.). The localities mentioned above may be the northern limit of the species, as some of the records by TAYLOR and HART from regions farther north have not been verified.

In our area exclusively a lowland plant.

Amongst the specimens from Mellemfjord occurs f. *viridescens* (Legr.) BRAUN-BLAQUET l. c. p. 616. which, according to my view, is a shade-form from thickets.

Gnaphalium silvaticum L. is recorded from South Disko by HART together with the preceding, but as specimens according to SIMMONS do not exist amongst his collections and as it has not been observed by other collectors in any part of Greenland, this record has to be considered an error.

Matricaria Chamomilla L. is considered by ROSENVINGE indigenous to Greenland, because the specimens collected by KORNERUP in N. Strømfjord are labelled: "near the border of the inland ice, far from the coast". They were found, however, in a district much visited for caribou-hunting and as the native hunters often take "*flores Chamomillae*" with them, as well as medicine as a substitute for tea, I shall consider the plant introduced till this record has been confirmed by more recent findings.

! 277. **Artemisia borealis** PALL.

On dry sandy or clayey slopes, on gravelly gneissic moraines, on dry river banks and deltas.

Disko: Very rare, although it is rather common on the mainland on the same latitude. Recorded from Godhavn, 69°15′ as collected by MARGRETE KRARUP SMITH, but as we have searched for it here in vain during many years the statement is perhaps due to some confusion of labels. — Mudderbugt 69°43′ (P.).

Mainland: From the Waygat coast of Nûgssuaq peninsula southwards, common, often forming extensive patches, especially in the interior.

North of our area scarce, however, ranging to at least 72°30′ (P.), south of the area known to 63°. As the species in America and Asia also reaches down to regions with temperate climates, I should rather consider it a southern type.

Remarkable is the absence in East Greenland.

Abundantly flowering and fructificating.

Without doubt often snowbare during winter.

V **278. Arnica alpina** (L.) Olin.

In herb-mats and luxuriant spots in the heath and on rock shelves.

Common throughout the area, especially at some distance from the coast.

A northern type without northern limit, south of our area ranging to the fjord district at 64° (Ros.).

From the shore to considerable altitudes.

Abundantly flowering and fructificating.

Covered by snow during winter.

On sunny spots, rich in mould a luxuriant form occurs:

f. *pluriceps* Haglund in herb. Described but not named by Rosenvinge: Andet Tillæg p. 701 as follows: *Ramosa, calathiis 3—5 bene evolutis; scapi laterales 1—2 foliis parvis*, non *oppositis muniti.*

This form was observed, for instance, at Godhavn (P.), Paotût (Th. P.), Orpigssuit (Htz.), N. Strømfjord (P. & E.).

T **279. Taraxacum phymatocarpum** J. Vahl.

Dahlstedt: Studier öfver arktiska Taraxaca. Ark. f. Bot. 2. N. 8. p. 22.

In dry morainic and stony soil, on gravelly banks in river deltas.

Disko: From 70°10′ on the west coast northwards and on the coast towards Waygat down to ca. 70°. gathered by several collectors and rather common. Otherwise only on the top of a hill near Mudderbugt, 69°50′, 875 m above the sea (P.).

Mainland: on Nûgssuaq peninsula on the west coast and the coast towards Waygat down to about 70° as well as in the big valley, rather common (P.).

Obs. Some of the specimens were determined by H. Dahlstedt.

A high-arctic type, the localities mentioned above are the southern limit.

Abundantly flowering and fructificating.

Probably covered by a thin layer of snow during winter.

! **280. Taraxacum groenlandicum** Dahlstedt:

Arktiska och alpina arter inom formgruppen Taraxacum ceratophorum (Led.) D. C. Arkiv f. Bot. 5. N. 9. p. 23. tab. 14—15. (*T. officinale ceratophorum* Lange pro maxima parte Consp. fl. Grl. p. 84.)

In sandy and gravelly soil, often on downs along the shore consisting not only of quartzic but also of basaltic sand.

Disko: hardly rare, most of the localities known are on the south coast, but also observed on the north coast and in the interior (P.). — Hare Ø (P.).

Mainland: Nûgssuaq peninsula on the coast and in the big valley common (P.). From Torssukâtak southwards observed in numerous localities to the fjords inland from Holsteinsborg (P. & E.).

Obs. A few of the specimens were determined by H. DAHLSTEDT.

North of our area known to at least 72°5′ (Ryder), south of 66°45′ no findings are reported till an isolated one at 61°. Not observed in East Greenland.

In accordance with the range of the species in Greenland and Arctic America (see DAHLSTEDT) probably a northern type.

Abundantly flowering and fructificating.

Covered by snow during winter.

T 281. **Taraxacum arctogenum** DAHLST l. c. p. 27. tab. 16.

A high-arctic type, occurring north of 76°, only once observed in our area on an islet in Sydost Bugt, 68°35′ (Htz. det. H. DAHLSTEDT).

Λ 282. **Taraxacum croceum** DAHLST. coll.

Confer. H. DAHLSTEDT: Om skandinaviska Taraxacumformer. Bot. Not. 1905. *idem:* Nordsvenska Taraxaca. Ark. f. Bot. 12. N. 2. 1912.

For the present I thus denote the most common species of *Taraxacum* in our area. They occur on favourable, sheltered spots, common in the southern parts of the area and, for instance on the southern half of Disko, but scarce or absent on the northern. Thus their occurrence corresponds to that of the southern types. The northernmost point, where I have seen a representative of this group, is on the south coast of Svartenhuk peninsula 71°25′ (P.).

In our area at least two species occur, one more common with pale flowers and a rarer one with larger and darker heads. The last mentioned seems to be restricted to the most favourable situations in the southmost parts of the area and on South Disko. I have not tried to identify them with some of the species of the group provisionally described by DAHLSTEDT in Bot. Not., but they seem to me to be related to DAHLSTEDT's N. 2: *spectabile* and N. 3: *croceum*, which, according to the author, are known to him from Greenland.

Abundantly flowering and fructificating.

Covered by thick layers of snow during winter.

⊥ 283. **Hieracium hyparcticum** ALMQ.

In luxuriant herb-mats and willow-thickets.

Mainland: Only observed in the southern parts of our area: N. Isortoq, 67°15′ (Ros.); S. Kangerdluarssuk, 67° (Ros.); Holsteinsborg, Præstefjæld, 66°55′ (several collectors) all determined by H. DAHLSTEDT. Naujarssuit in Qeqertalikfjord, 66°45′ (P. & E.) det. by C. H. OSTENFELD.

A distinct southern type, south of the area known to 60°. The above mentioned localities are the northern limit.

Only from lowlands stations.
Abundantly flowering and fructificating.
Covered by thick layers of snow during winter.

⊥ 284. **Hieracium groenlandicum** Almq.

In luxuriant herb-mats and willow-thickets.

Disko: North coast of Diskofjord at 69°33′ (Porsild & Rikli), det. Dahlstedt.

Mainland: Near the mouth of N. Strømfjord, ca. 67°33′ (Korn.) det. Dahlstedt; Holsteinsborg, Præstefjæld, 66°45′ (P. & E.) and Naujarssuit, 66°45′ (P. & E.) det. C. H. Ostenfeld.

A distinct southern type, the localities mentioned are the northern limit.

Only occuring in the lowland.

Abundantly flowering and fructificating.

Covered by thick layers of snow during winter.

The specimens from Diskofjord were tall and vigourous forming a patch of 20—30 flowering specimens. Some were transplanted to South Disko, where they flowered the first years, but gradually they were overpowered by other vegetation, ceased flowering and at last disappeared entirely.

⊥ 285. **Hieracium groenlandicum** Almq. var. **ivigtutense** Almq.

Only once observed in our area, at Præstefjæld near Holsteinsborg, 66°45′ (W. & H.) det. Dahlstedt. Otherwise not known north of 61°15′. Thus a distinct southern type.

POSTSCRIPT

When in 1920 the Committee for the geological and geographical investigations of Greenland kindly undertook to publish the present work and immediately put the first part to press I hoped to be able to finish the second part during the printing of the first part. In this, however, I was hindered by various other works of official character, travels abroad etc., and later on both I and my collaborator have had occasion to make further observations in hitherto unexplored parts of the area whereby the preliminary work accomplished for the second part had to be revised. This second part will contain a survey of the distribution of the species and types of plants within the area as far as possible with due allowance to the geographical, geological and climatological conditions.

My reason for letting the first part appear before finishing the second is due to the purely practical demand that the present volume in "Meddelelser om Grønland" has to be concluded. In this connection I must express my sincerest thanks to the Committee for the unique patience shown at this delay.

Morten P. Porsild.

Disko. October 1925.

ARBEJDER FRA
DEN DANSKE ARKTISKE STATION PAA DISKO Nr. 12

II.

CONTRIBUTIONS TO THE FLORA
OF
WEST GREENLAND AT 70°—71°45′ N. LAT.

BY

A. E. PORSILD

1926

DURING the summer of 1921 Professor SEWARD and Mr. R. E. HOLTTUM of Cambridge, England, visited Greenland and, with the Danish Arctic Station as headquarters made boat excursions to the famous fossiliferous strata of the Cretaceous and Tertiary areas of the Nordost-bugt and the Waygat coasts. To facilitate the work of Prof. SEWARD I was commissioned by the Director of the Arctic Station to undertake the arrangements incidental to the Expedition.

Prof. SEWARD (26) published an account of his visit in a book entitled "A summer in Greenland" and his Research Assistant Mr. R. E. HOLTTUM (6) gave a brief description of plant life in Greenland in which he also incorporated his own observations. In both publications a number of excellent photographs illustrate different aspects of the vegetation.

I had thus the privilege in the company of the English Botanists to visit a number of places hitherto only partially explored. But as the area thoroughly investigated is always small compared with the vast extent of the country every traveller who leaves the ordinary routes may expect to make new and interesting observations and to add to the records on the distribution of plants given by previous collectors (see Bibliography).

Had our route been selected with special reference to the most promising localities of living plants my collections would undoubtedly have been more copious and more interesting, but our principal aim was the collection of fossils. The richest localities for fossil plants do not always coincide with the most favourable conditions for the plant-life of to-day.

I nevertheless succeded in obtaining abt. 1000 specimens of herbarium plants and a number of observations on the flora of the districts visited, besides several unexpected records of range-extensions. I owe this in part to the courtesy of Prof. SEWARD who always gave every consideration to my work, and I offer him my best thanks.

As the inner and northern parts of the Nordost Bugt are out of the way of the ordinary travel-routes, I append a brief account of my observations.

Hare Ø, off the northern entrance of the Waygat Sound, is a flat topped, bleak basaltic island of 170 km.² rising to a hight of 515 m. The coast is precipitous, with very narrow strips of foreland; the anchorage is bad and there are no protective coves.

The flora has been investigated thrice, the last time by Porsild (17). To his enumeration of 112 species I can add four — *Lycopodium Selago*, *Papaver radicatum*, *Epilobium arcticum* and *Diapensia.*

Upernavik Ejland 71°9′—23′ is a striking contrast to the inhospitable Hare Ø. It is abt. 560 km.², and the mountains of gneiss or granite on the north-west corner are the highest in West Greenland, while the Archaean rocks on the south-west corner are overlaid by fossiliferous sandstones and shales.

The interior is occupied by glaciers of which not less than abt. 20 extend to within a short distance from sea. The island is therefore rightly named the most beautiful and wildest place in Greenland.

When I had investigated the flora of the sandstone I wished to compare it with that on the gneiss which on the west coast is separated from the sandstone by a glacier. According to K. J. V. Steenstrup (29, p. 226) this glacier in 1880 reached the sea and terminated in a steep front, and even as recently as some twenty years ago, according to a native living at Upernavik Næs, it produced icebergs. Now the front has retreated about one kilometer from the coast. It was impossible to cross the glacier torrent or the crevasses of the glacier below a height of abt. 300 m. where at last I reached the exposed Archaean rocks on the far side. The hillside was however much too steep to climb and on the limited space of a small terrace I only noticed a few plants not seen on the sandstone: *Dryopteris fragrans*, *Cystopteris*, *Woodsia ilvensis* and *glabella*, *Lycopodium Selago* and *annotinum*, *Saxifraga Aizoon* a. o.

Returning across the glacier I saw a heap of gravel which had apparently fallen on to the glacier from the steep hillsides. On this heap was a *Salix glauca*, actually growing on the moving glacier.

The plants collected on the sandstone in addition to the more or less common arctic types include such distinct southern types as *Botrychium Lunaria*, *Juncus arcticus* and *trifidus*, *Poa alpina*, *Festuca rubra*, *Elymus*, *Carex alpina*, *Luzula spicata*, *Viscaria alpina*, *Arabis alpina*, *Draba aurea*, *Sibbaldia*, *Veronica alpina*, *Bartschia*, *Euphrasia* and others. The occurence of *Botrychium Lunaria* here is perplexing as on the mainland it is not known north of the 65th parallel, while at the warm springs of Disko it reaches 69°14′. Nearly as surprising was the absence of the high-arctic types which are common on the corresponding areas of the Nûgssuaq Peninsula: *Dupontia Fisheri*, *Carex ursina*, *Lesquerella*, *Arabis arenicola*, *Braya purpurascens*, *Taraxacum phymatocarpum* a. o.

From **Ũmánaq** we sailed for **Kûk** better known as "Kome" the famous site for the Cretaceous Kome fossils at the north coast of the Nûgssuaq Peninsula. Vanhöffen collected plants at this locality in 1892. The river which has given its name to the place has formed a narrow valley where sediments and gneiss meet in the riverbed. Here among boulders and shingle I noticed a few arctic species: *Lesquerella*, *Dryas integrifolia* var. *canescens*, *Potentilla Vahliana* and *Calamagrostis purpurascens*.

In a *Cassiope tetragona* heath gently sloping towards the river I noticed the very rare and high-arctic *Eutrema Edwardsii* one specimen of which was recorded from here by Vanhöffen. It occurred with *Arctagrostis*, *Tofieldia palustris*, *Pedicularis hirsuta* in damp mosses where the heather was not too dense. The specimens were scattered and I only picked up a score, some of which were seedlings. Flowering was partially over (July 26th).

On the north coast of the Peninsula several landings were made. The features of the landscape are almost uniform. Towards the sea low sand dunes with *Elymus*, *Festuca rubra* var. *arenaria*, *Taraxacum groenlandicum*, *Carex incurva* and *Honckenya*. Beyond the sand dunes are shallow lagoons along which is a belt of *Puccinellias*, *Carex ursina*, *incurva* and *glareosa*, and between the lagoon and the dry land there is a peculiar form of salt marshes on which sometimes very extensive patches of the beautiful, high-arctic grass *Dupontia Fisheri* and *Carex rariflora* may be seen.

From the lagoon the land often rises to a slightly elevated plain cut by numerous rivulets and from this plain the mountain range parallel to the coast line sometimes rises to nearly 2000 m. Here and there a glacier-river has cut through the mountains and from a steep gorge it debouches on the lower ground where a fanshaped erosion-cone strewn with boulders is formed. The glacial streams constantly change their course and during the melting period very considerable masses of detritus are carried down from the highland.

The characteristic features of the vegetation at this locality closely resemble Warming's "Fjældmark" and are well described by Holttum l. c. p. 95.

At **Qaersuarssuk** at a small lagoon in addition to the characteristic *Dupontia* and *Carices* I also saw the rare and southern type *Potentilla Egedii* in full flower.

The low terrace above the settlement is exceedingly barren and the vegetation is of the usual xerophile type: *Carex nardina* and *rupestris*, *Cobresia Bellardi*, *Braya purpurascens*, *Draba magellanica* subsp. *cinerea*, *Lesquerella*, *Potentilla Vahliana* and *pulchella*, *Dryas integrifolia* var.

canescens, *Erigeron compositus* and besides the very rare, high-arctic *Poa abbreviata.*

A small tributary to the river of Qaersuarssuk flows in a slight depression through this plain and has given rise to a boggy stretch of hummocks where *Arctagrostis*, and *Carices* abound. On small hummocks covered with moss I found for the second time the rare *Eutrema.* The plants were scattered and had finished flowering. During one hour's eager search I only found a dozen specimens of which none were so vigorous as the specimens described by Porsild (19, p. 376).

At a place named **Agiussuit** we stopped two days to collect fossils and during the whole trip I never saw a place so barren and devoid of vegetation. On the sandy slope near the inlet of a small ravine the total flora observed comprised 8 vascular plants: *Festuca brevifolia*, *Poa abbreviata*, *Cerastium alpinum* var., *Salix glauca*, *Papaver radicatum*, *Polygonum viviparum*, *Chamaenerium latifolium*, *Taraxacum phymatocarpum*, and some *Lichens.* It was therefore rather astonishing to see a butterfly resting on one of the prostrate twigs of a *Salix* which had already finished fruiting.

At **Niaqornat** we only stopped a few hours to replenish our stock of coffee and water and I therefore could not make extended excursions.

Across the sheltered bay to the eastward of the protruding headland of Niaqornat the strong current has deposited a narrow strip of sand which has caused the formation of a shallow lagoon apparently without vegetation except some *Algae* which have coloured the water of the lagoon light green.

The Settlement seen from the low hills to the South, situated between the low tufa hummocks behind the headland covered with the vermilion-coloured Lichen, *Xanthoria elegans*, and reflected in the green lagoon, made a very picturesque scene.

From Niaqornat we visited the trading place of the same name as the peninsula, and, for the second time, called at Hare Ø before we landed at **Alianaitsúnguak** on Aug. 4th for the night. The coast is here formed by tufa strewn with glacial boulders. Some sixty meters above sea-level some springs had formed a verdant slope. Amongst tall grasses large specimens of *Cochlearia* abounded. As a rule *Cochlearia*s are seldom met with outside the halophilous vegetation belt of the strand and on bird-cliffs.

At **Atâ** and **Pâtût** we spent several days in search of fossils. At Pâtût, together with Mr. Holttum, I climbed to the uppermost sedimentary strata and there, on a 100 m. broad terrace 670—770 m. above sea-level, compiled a list of plants as complete as possible. Hartz (4, p. 49) describes the vegetation of the mountain slope at this locality

and from the same latitude I have incorporated three species not seen by myself.

In the enumeration inserted below of the total flora of Pâtût the column A. stands for the plants occurring in the lowland while B. denotes plants observed on the terrace 670—770 m. above sea-level.

Types widely distributed in West Greenland.

	A.	B.
Equisetum variegatum	x	x
E. arvense	x	x
Calamagrostis purpurascens	x	x
Trisetum spicatum	x	x
Poa pratensis	x	x
P. glauca	x	x
Phippsia algida		x (Hartz)
Festuca ovina	x	x
Eriophorum angustifolium	x	x
E. Scheuchzeri	x	x (Hartz)
Cobresia bipartita	x	
Carex nardina	x	x
C. incurva	x	x
C. rigida	x	
C. capillaris	x	
Juncus triglumis	x	
J. biglumis	x	x
Luzula confusa	x	x
Tofieldia palustris	x	
Salix herbacea	x	x
S. groenlandica		x
S. glauca	x	x
Betula nana	x	
Oxyria digyna	x	x
Polygonum viviparum	x	x
Sagina intermedia	x	
Honkenya peploides	x	
Minuartia verna		x
Stellaria longipes	x	x
S. humifusa	x	
Cerastium alpinum	x	x
Silene acaulis	x	x
Ranunculus pygmaeus	x	x
R. hyperboreus	x	x
Papaver radicatum	x	x
Arabis arenicola		x
Draba nivalis	x	x
D. magellanica subsp. *borea*	x	x
Saxifraga oppositifolia	x	x
S. nivalis	x	x
S. groenlandica	x	x
S. cernua	x	x
Dryas integrifolia	x	x
Empetrum nigrum	x	x
Chamaenerium latifolium	x	x
Ledum decumbens	x	
Rhododendron lapponicum	x	
Myrtillus uliginosa var. *microphyllum*	x	x
Statice sibirica	x	
Mertensia maritima	x	
Pedicularis flammea	x	x
Campanula rotundifolia	x	x
Erigeron unalaschkensis	x	x
Antennaria alpina	x	x
Artemisia borealis	x	x

Northern types:

	A.	B.
Alopecurus alpinus		x
Puccinellia Vahliana	x	x
Carex ursina	x	
C. rupestris	x	x
C. stans	x	
C. misandra	x	x
Luzula nivalis	x	x
Arenaria ciliata var. *norvegica*	x	

	A.	B.
Minuartia stricta	x	
Melandrium apetalum	x	x
M. affine	x	
M. triflorum	x	
Ranunculus affinis		x
R. nivalis		x
R. sulphureus		x
Braya purpurascens	x	x
Draba magellanica subsp. *cinerea*	x	x
D. rupestris		x
D. alpina		x
Lesquerella arctica	x	x
Saxifraga tricuspidata	x	x
S. comosa	x	
Potentilla nivea	x	x
P. pulchella	x	
Epilobium arcticum		x (Hartz)
Pirola grandiflora	x	
Cassiope tetragona	x	x
Pedicularis hirsuta	x	x
P. lanata	x	x
Campanula uniflora		x
Erigeron eriocephalus	x	x
E. compositus	x	x
Arnica alpina	x	x

	A.	B.
Southern and lowland types:		
Poa alpina	x	x
Puccinellia retroflexa	x	
Festuca rubra	x	
Agropyron violaceum	x	
Elymus arenarius var. *villosus*	x	
Carex scirpoidea		x
C. gynocrates	x	
Juncus arcticus	x	
J. castaneus	x	
Luzula spicata	x	x
L. frigida	x	
Minuartia biflora	x	x
Cerastium trigynum	x	x
Viscaria alpina	x	
Thalictrum alpinum		x
Arabis alpina	x	x
Potentilla alpestris	x	
Phyllodoce coerulea	x	
Veronica alpina	x	x
Bartschia alpina	x	
Pedicularis lapponica	x	
Pinguicula vulgaris	x	
Antennaria intermedia	x	
A. glabrata	x	
Taraxacum groenlandicum	x	x
T. croceum		x

	Lowland		common		670—770 m.		total	
	number	p. c.	number	p. c.	number	p. c.	number	p. c.
species widely distributed in West Greenland	13	11	38	33	4	4	55	48
northern species	9	8	16	14	8	7	33	29
southern species	16	14	7	6	3	3	26	23
total...	38	33	61	53	15	14	114	

Thus the total known flora of Pâtût includes only 114 species of vascular plants, which is but $^3/_5$ of the flora known from the adjacent Ritenbenk and Ũmánaq districts, but this, as I shall try to show later,

may be largely due to the xerophilous character of the mountain slopes of Pâtût.

Of the total number 99 species are found in the lowland and 76 in the highland.

The first section of the list gives the widely distributed arctic species, which occur along the whole coast of West Greenland. Of this group, amounting nearly to one half, 13 are peculiar to the lowland, 4 to the highland, and 38 common. To any one familiar with the flora it is obvious that within this group the absence of a species either in the lowland or on the high terrace, must mainly be due to lack of suitable stations. This is of course applicable to halophytes such as *Honckenya*, *Stellaria humifusa* and *Mertensia*, which are always restricted to the sea shore, while such species as *Ledum decumbens*, *Rhododendron* and *Statice* seldom occur at this latitude at so high an altitude.

The next group comprises the decidedly northern types, few of which range far southwards beyond Disko Bay. Of the 9 species peculiar to the lowland, *Carex ursina* is confined to the shore, while common species such as *Arenaria ciliata*, *Melandrium triflorum* and *affine*, *Saxifraga comosa* and *Pirola grandiflora* are common at other places even at greater heights.

The most striking contrast therefore is to be found in the group of the southern and lowland types amounting to 26 species of which but 16 are peculiar to the lowland, 7 common and, curiously enough, 3 occur on the highland only. Of the lowland species *Puccinellia* and *Elymus* are restricted to the shore.

It is, indeed, surprising that not less than 10 species reach an altitude of 670—770 m., but this may possibly be explained by the much more genial soil of the terrace produced by the basalt, which on several places rests on the sandstones, and by an abundance of water supplied by a small brook.

Of high-arctic types only two species are noteworthy, viz. *Ranunculus affinis* and the recently described species *Epilobium arcticum*.

Generally, the vegetation had the character of typical "Fjældmark" in Warming's sense. Only near and along the watercourse mentioned by Hartz l. c. was a green slope fairly covered by vegetation, showing that a good supply of water during the short summer period and the certainty of a sufficient covering of snow or ice during winter were enough to produce a closed turf of vegetation.

The appearence of the sloping fore-land of Pâtût is very remarkable. Wandering here a hot day of August the general features does not agree with those usually applied to land within the arctic circle. The red and grey brick-like shingle so peculiar to Pâtût absorbs the rays of the sun to such an extent that the warmth actually is felt

through the thickest soles. Towards noon it is mostly dead calm and the air temperature may rise as high as 25° C. The surplus water of spring time has now all evaporated. The soil has been baked hard as brick and is netted all over with fine sun-cracks. The botanist not familiar with the local flora would hardly expect to find any plants here: still there are a few — the association of the arctic "desert" — hardly more than 15—20, mostly xerophilous. Here is a *Calamagrostis purpurascens* and there a *Carex nardina* or a *Festuca ovina*. Now and then a prostrate *Salix glauca* which during a century perhaps has developed a few crooked branches. During a snowless winter long ago the frost killed the most protruding branches among which a handful of organic matter has accumulated on which grows either a *Carex rupestris* or a *Cerastium alpinum*. For the most part there are only *Cruciferæ* and *Compositæ*; *Lesquerella* with countless fruiting stems which in June and July bear clusters of bright yellow flowers which ripen their seeds in August. *Braya purpurascens*, *Arabis arenicola* and *Draba magellanica* subsp. *cinerea* are all very insignificant when not in flower, while the erect stems of *Artemisia* and *Erigeron compositus* render them more conspicuous.

The vegetation of **Atanikerdluk** affords a striking contrast to the poor "Fjældmark" of Pâtût; probably, as suggested by Berggren (2, p. 889), this is due to the influence of the basalt.

In a small pond on the peninsula I collected some aquatic plants: *Potamogeton filiformis*, *Ranunculus confervoides*, *Hippuris vulgaris* and at the borders dense growths of *Eriophora* and *Carices* together with the rare *Calamagrostis neglecta*. In the thin débris on the bottom I saw some dense, green clumps which on closer examination turned out to be *Heleocharis acicularis* f. *submersa*. As neither Hartz nor Nathorst (13) mention *Heleocharis*, a species forming conspicuous masses in 1921; it is possibly a recent immigrant. Near the summit of the peninsula I found the white-flowered *Chamaenerium latifolium* mentioned by Nathorst l. c. p. 18.

On the mainland several fertile slopes almost resembled the "Urteli" so well known from south Disko, characterized by broadleaved herbaceous vegetation as *Poa alpina*, *Carex Macloviana*, *scirpoidea*, *alpina*, *Viscaria*, *Thalictrum*, *Sibbaldia*, *Potentilla alpestris*, *Veronica alpina* and *saxatilis*, *Antennaria glabrata* and *intermedia*, *Arnica* and a most puzzling *Polygonum viviparum* with a paniculate inflorescence.

The vegetation of **Sarqaq** has been investigated by several botanists and is therefore well known. It presented many interesting features as the rock is gneissic and thus affords a good basis for a comparison of the flora with that on the rest of the Nûgssuaq peninsula.

The most striking feature was of course the closed vegetation of

heather which here shows many examples of transitions from the most common *Myrtillus* heath with *Loiseleuria*, *Phyllodoce* and *Ledum* to the less common, almost pure *Empetrum* heath. On July 12th both *Myrtillus* and *Empetrum* were covered with ripe berries.

Moreover all the northern *Cruciferæ* and *Compositæ* were absent, even such as *Lesquerella*, *Braya*, *Arabis arenicola* and *Erigeron compositus* and *eriocephalus* which were common at Atanikerdluk.

The following new and additional species may be mentioned: *Juncus supinus* which has only been recorded a few times from Greenland and previously not north of 68°39′; *Potamogeton filiformis* and *Arnica alpina* n. f. *inundata* growing in the stiff clay of a desiccated pond which probably contained water during the greater part of the season. It looked most curious and had developed long, horizontal underground shoots, some exceeding one meter. Nearly all the specimens were sterile and resembled a broad-leaved *Luzula*.

From Sarqaq we visited **Naujat** in an Umiaq and here perhaps, I saw the most luxuriant vegetation met with in the course of the whole trip. Near the landing place *Arabis Holboelli*, and *Draba aurea* abounded together with *Antennaria intermedia* and probably a new species of the same genus.

Behind the coast cliffs of tufa and basalt a depression is occupied by a swampy valley with a series of small lakes and ponds all more or less overgrown by an occasionally floating carpet of vegetation in which *Carices* and *Eriophoræ* as high as one metre played a most conspicuous part, together with a low scrub of willows which seldom occur in such places. This treacherous border of the swamps was very difficult to approach and only by stripping was it possible to get near the edge. By means of an apparatus constructed of my photographic tripod and a pickaxe I was fortunate enough to dredge up a few interesting aquatic plants: *Potamogeton filiformis* and *groenlandicus*, *Sparganium submuticum*, *Callitriche autumnalis*, *Hippuris*, *Ranunculus confervoides* and *Heleocharis acicularis* f. *submersa*.

A couple of loons had obviously nested among the willows: mosses were brought up from the edge and amongst them I saw numerous specimens of a *Limnæa* (probably *Vahlii* or *Holboelli*), a very scarce animal on this latitude. In a small pond near the shore I found numerous sterile specimens of *Ranunculus reptans*.

In the evening we returned to Sarqaq and from there proceeded for Godhavn via Ritenbenk and Jacobshavn.

List of vascular plants

from the "Nordostbugt" and the Waygat Coast of Nûgssuaq Peninsula.

List of stations visited during the summer trip:

Upernavik Ejland 71°10′[1]); Hare Ø: Umîvik 70°26′; Ũmánaq 70°40′; On the coast of Nûgssuaq Peninsula: Kûk ("Kome") 70°36′; Patorfik 70°42′; Qaersuarssuk 70°44′; Ikorfat 70°46′; Agiussuit 70°46′; Kûk angnertuneq 70°46′; Niaqornat 70°47′; Alianaitsúnguaq 70°22′; Atâ 70°16′; Pâtût 70°14′; Atanikerdluk 70°2′; Naujat 70°; Sarqaq 70°.

In order to give as complete a list as possible of the total flora of the districts visited, I have incorporated a few species recorded by previous collectors, but not seen by me. The following abbreviations are adopted: (V.) = J. Vahl; (Vh.) = Vanhöffen; (Nath.) = Nathorst; (Hz.) = Hartz; (Bg.) = Berggren; (S. H.) = Sören Hansen; (P.) = Porsild, and (P. & E.) = E. & M. P. Porsild.

1. *Dryopteris fragans* (L.) Schott. — Upernavik Ejland and Sarqaq.
2. *Cystopteris fragilis* (L.) Bernh. — Upernavik Ejland, Patorfik, Naujat and Sarqaq.
3. *Woodsia ilvensis* (L.) R. Br. var. *alpina* (Bolton) Aschers. & Graebn. — Upernavik Ejland and Sarqaq.
4. *W. glabella* R. Br. — Upernavik Ejland.
5. *Botrychium Lunaria* (L.) Sw. — Upernavik Ejland on coarse sandstone gravel. The northern limit hitherto known was in West Greenland on S. Disko at 69°14′ and on the mainland only at 65°10′.
6. *Equisetum variegatum* Schleich. — Common everywhere.
7. *E. arvense* L. — As the preceding.
8. *Lycopodium Selago* L. — Hare Ø: Umîvik (new to the flora of that island), Upernavik Ejland, Kûk, Patorfik, Ikorfat, Alianaitsúnguaq, Naujat and Sarqaq.

[1]) The latitude of Upernavik Ejland on the printed labels of some of my distributed specimens is given incorrectly as "71°20′" instead of 71°10′.

9. *L. annotinum* L. — Upernavik Ejland, Naujat and Sarqaq. As the preceding.
10. *L. alpinum* L. — Nûgssuaq (P.), Majorqarssuatsiaq (Bg.).
11. *Sparganium submuticum* (Hartm.) Neum. — Naujat.
12. *Potamogeton groenlandicus* Hagstr. — Naujat and Sarqaq.
13. *P. filiformis* Pers. — Atanikerdluk, Naujat and Sarqaq.
14. *Triglochin palustre* L. — Atâ.
15. *Hierochloë alpina* (Liljebl.) R. & S. — Naujat and Sarqaq.
16. *Alopecurus alpinus* Sm. — Common.
17. *A. aristulatus* Michx. — Sarqaq.
18. *Agrostis borealis* Hartm. — Qarajaq Nunataq (Vh.), Majorqarssuatsiaq (Bg.).
19. *Arctagrostis latifolia* (R. Br.) Griseb. — Kûk, Patorfik, Qaersuarssuk, Ikorfat, Naujat.
20. *Calamagrostis purpurascens* R. Br. — Common on the sediments but nowhere else observed.
21. *C. Langsdorfii* (Link) Trin. — Qeqertaq (P.).
23. *C. neglecta* (Ehrh.) Fl. d. Wett. — Atanikerdluk.
24. *Deschampsia caespitosa* (L.) var. *pumila* Ledeb. — Hare Ø (Nath.), Sarfarssuit (P.).
25. *Trisetum spicatum* (L.) Richt. — Common on all soils.
26. *Dupontia Fisheri* R. Br. — Patorfik, Qaersuarssuk and Atâ. On salt marshes.

Phippsia algida (Sol.) R. Br. — Ikorfat, Alianaitsúnguaq and Atâ.

27. *Poa pratensis* L. — On the clays on the north side of Nûgssuaq Peninsula the broad-leaved var. *domestica* Laest. attained a large size: it grew for the most part solitary or in small clumps or tufts.

The var. *alpigena* of Blytt was, perhaps, the commonest.

f. *prolifera.*

Near the trading place Niaqornat on the borders of small ponds, the water of which was stained by refuse from the Eskimo houses, a viviparous form of *Poa pratensis* abounded. Probably the "*proliferous Poa*" recorded from Ellesmereland by Simmons p. 169, which he with some doubt refers to *Poa pratensis*. My specimens formed quite pure patches.

While other species of the genus *Poa* f. inst. *P. alpina* and others are often recorded as viviparous, and, under certain climatic conditions, are only known in that state: vivipary does not seem to be common in *P. pratensis*. At any rate I have seen no other record in the literature.

The records of viviparity in high-arctic species of *Poa* are interesting for another reason, namely in relation to some old state-

Poa pratensis L. f. *prolifera* Simm.
Plants $^2/_5$ nat. size.

ments which do not concord with our present knowledge of the ranges of the species.

Thus *P. alpina* L. has several times been recorded from the northernmost West Greenland and Ellesmere Land though its range in West Greenland even from 71°—74° Lat. N. is restricted to the most sheltered stations in the lowland. H. G. Simmons (27, p. 166) has but very little confidence in those statements as he has not seen the specimens in question himself. The more recent of these are:

Poa alpina var. *vivipara*, Grinnell Ld., Lady Franklin Bay, Greely, and

Poa alpina, Nth. Side of St. Johns Sound, H. E. Wetherill.

Now my father, Mr. MORTEN P. PORSILD, who has seen the specimens of both collections in the Gray Herbarium, Cambridge, Mass. tells me that the first represents a depauperate, viviparous culm without basal leaves. To him it seemed to be quite identical with my viviparous form of *Poa pratensis*.

The other specimens, subsequently to WETHERILL's identification, have been referred by the staff of the Gray Herbarium to *Poa laxa*, but the specimens are probably badly developed forms of the polymorphus *Poa glauca* or of *P. arctica*, as already suggested by SIMMONS l. c.

28. *P. arctica* R. Br. — Not as common as the preceding.
29. *P. alpina* L. — Upernavik Ejland, Kûk, Patorfik, Alianaitsúnguaq, Atâ, Pâtût, Atanikerdluk, Naujat and Sarqaq. Common when sufficient moisture and humus is available.
30. *P. abbreviata* R. Br. — Agiussuit and Qaersuarssuk.
31. *P. glauca* M. Vahl. — Common everywhere.
32. *Puccinellia Vahliana* (Liebm.) Scribn. & Merr. — Upernavik Ejland, Hare Ø, Alianaitsúnguaq, Pâtût 670—770 m. and in the lowland.
33. *P. phryganodes* (Trin.) Scribn. & Merr. — Kûk, Patorfik, Atanikerdluk.
34. *P. angustata* (R. Br.) Rand. & Redf.
35. *P.* — var. *vaginata* (Lge.) Holmb.
36. *P. tenella* (Lge.) Holmb.
37. *P. arctica* (Hook.) Fern. & Weath.

(Of these 4 *Puccinellia* species I have several specimens, but, as HOLMBERG's interpretation has not yet been published, I will not venture to identify them.)

38. *Festuca ovina* L. — Common.
39. *F. brevifolia* R. Br. — Ujaragtôrssuit 70°44′, Patorfik and Qaersuarssuk.
40. *F. rubra* L. var. *arenaria* Osb. — Common on sandy shores.
41. *Agropyron violaceum* (Horn.) Lange. — Pâtût, Atanikerdluk.
    var. *virescens* Lange. — At Pâtût common on some raised clays near the shore. Hitherto not recorded north of 61° Lat. N.
42. *Elymus arenarius* L. var. *villosus* E. Mey. — Upernavik Ejland rare. Common on the shores of the Nûgssuaq Peninsula.
    var. *compositus* Abrom. — Atanikerdluk.
43. *Eriophorum angustifolium* Roth. — Common.

44. *E. Scheuchzeri* Hoppe. — Common.
45. *Heleocharis acicularis* (L.) R. Br. f. *submersa* Hj. Nilss. — Atanikerdluk and Naujat.
46. *Scirpus caespitosus* L. subsp. *austriacus* (Palla) Asch. & Graeb. — Atanikerdluk (P.).
47. *Cobresia Bellardi* (All.) Degl. — Common on the sandstone.
48. *C. bipartita* (All.) Dalla Torre. — Atâ and Pâtût.
49. *Carex nardina* Fr. — Very common, even on the most barren and dry places.
50. *C. capitata* Sol. — Ũmánaq (V.), Ikerasak (Vh.).
51. *C. incurva* Lightf. — Common on the shores of the Nûgssuaq Peninsula, but always rare outside the coastal region.
52. *C. Macloviana* d'Urv. — Atanikerdluk and Naujat.
53. *C. lagopina* Wahl. — Common in most places.
54. *C. glareosa* Wahl. — Common along the shores.
55. *C. ursina* Dew. — Rather common on the Nûgssuaq Peninsula, Patorfik, Kûk, Atâ, Pâtût and Atanikerdluk.
56. *C. gynocrates* Wahl. — This rare *Carex* has only been recorded from Greenland a few times; I collected it at Pâtût and Sarqaq.
57. *C. alpina* Sw. — Only on humus.
58. *C. holostoma* Drej. — Ũmánaq (V.).
59. *C. rariflora* (Wahl.) Sm. — Common on all moist places, especially near the shore.
60. *C. stans* Drej. — In swampy places.
61. *C. subspathacea* Wormskj. — Atâ at the well known habitat.
62. *C. rigida* Good. — Common in most places. — var. *concolor* R. Br. — On similar places as *C. stans.*
63. *C. bicolor* All. — Always rare. Atâ.
64. *C. scirpoidea* Michx. — Like *C. alpina.*
65. *C. rupestris* All. — The commonest *Carex.*
66. *C. supina* Wahl. — Upernavik Ejland and Atâ.
67. *C. pedata* Wahl. — Sarqaq.
68. *C. capillaris* L. — Common, especially on fresh moraines.
69. *C. microglochin* Wahl. — Ũmánaq (V.), Ikerasak (Vh.).
70. *C. misandra* R. Br. — Common. As *C. capillaris.*
71. *C. atrofusca* Schkuhr. — Ubekendt Ejland and Marraq (P.), Qarajaq (Vh.).
72. *C. rotundata* Wahl. — Sarqaq.
73. *C. saxatilis* L. — Ũmánaq (V. & Vh.), Ikerasaq (Vh.).
74. *Juncus arcticus* Willd. — Common. Even at Upernavik Ejland near its northern limit.
75. *J. supinus* Moench. — Sarqaq. Previously recorded from three places in Greenland of which 68°39′ was the most northernly.

76. *J. castaneus* Sm. — Common, together with *C. arcticus*.
77. *J. triglumis* L. — Common, even at Upernavik Ejland near its northern limit.
78. *J. biglumis* L. — Very common.
79. *J. trifidus* L. — Upernavik Ejland and Qaersuarssuk. Previously not north of the South coast of Disko.
80. *Luzula spicata* (L.) D.C. — Only on the most sheltered places. Upernavik Ejland, Pâtût, Atanikerdluk, Naujat and Sarqaq.
81. *L. confusa* Lindeb. — Common.
82. *L. nivalis* Laest. — Common everywhere.
83. *L. frigida* (Buch) Sam. — Like the preceding.
84. *Tofieldia palustris* Huds. — Common.
85. *T. coccinea* Rich. — Qeqertarssuaq 71°34′. On a winter journey 1923, when I was engaged in collecting some *Eutrema Edwardsii* which pierced through the snow, I by chance got a few specimens of this rare plant; it has been recorded from Greenland a few times only.
86. *Salix herbacea* L. — Common everywhere when sufficient humus is available.
87. *S. groenlandica* Lundstr. — Not common, especially not on the Nûgssuaq Peninsula.
88. *S. glauca* L. — Never absent.
89. *Betula nana* L. — Rather common, but the habitats are always scattered.
90. *Oxyria digyna* (L.) Hill. — Never absent.
91. *Polygonum viviparum* L. — Probably the most common plant of the districts visited and unlikely to be unrepresented in any plant association.

monstr. *paniculata* var. nov. *Inflorescentia paniculatim composita, ramis cincinnato-spiciformibus 20—30, inferioribus usque ad 25 mm. longis, floribus bulbillisve parvulis 12—15-nis gerentibus.*

This curious and very conspicuous inflorescence may perhaps be considered as a case of an atavistic reversion to the more ancestral types of the family.

At Atanikerdluk on a fertile slope in a typical "Urteli" association.

92. *Koenigia islandica* L. — Upernavik Ejland, Kûk, Ikorfat.
93. *Sagina intermedia* Fenzl. — Upernavik Ejland, Pâtût and Atanikerdluk.
94. *S. caespitosa* (J. Vahl) Lange. — Atanikerdluk.
95. *Honkenya peploides* (L.) Ehrh. — Never absent on sandy beaches.
96. *Arenaria ciliata* L. subsp. *norvegica* (Gunn.) Fries. — Upernavik Ejland, Ikorfat, Atâ, Pâtût and Atanikerdluk.

Polygonum viviparum L. monstr. *paniculata.*
Inflorescences $1^1/_2$ nat. size.

97. *Minuartia biflora* (L.) Schinz & Thell. — Common on places rich in humus.
98. *M. stricta* (Sw.) Hiern. — This rare *Minuartia* has only been collected a few times in the district. I saw it only once; a few specimens were found at Patorfik.

99. *M. verna* (L.) Hiern. — Common on open, barren ground.
100. *Stellaria humifusa* Rottb. — Common along the shores.
101. *S. longipes* Goldie. — Very common.
102. *Cerastium trugynum* Vill. — Pâtût and Atanikerdluk.
103. *C. alpinum* L. — Very common and very variable, probably according to the habitats.
104. *Melandrium apetalum* (L.) Fenzl. — Fairly common on moist places in moss.
105. *M. affine* J. Vahl. — Common, still not as common as the following.
106. *M. triflorum* (R. Br.) J. Vahl. — Very common, especially on manured soil and on clay.
107. *Silene acaulis* L. — Very common.
108. *Viscaria alpina* (L.) Don. — Upernavik Ejland, Pâtût, Atanikerdluk, Naujat and Sarqaq.
109. *Montia lamprosperma* Cham. — Ũmanaq Storø and Ikerasak (Vh.).
110. *Ranunculus confervoides* (Fr.) Asch. & Graebn. — Atanikerdluk and Naujat. At the latter place very abundant where sterile plants grew to a depth of one metre.
111. *R. affinis* R. Br. — At Pâtût at an altitude of 770 m. on a dry slope of basaltic gravel. In Greenland recorded from a few places only viz. West Greenl. 78°—79° and 66°—67°, East Greenl. 70°—74°.
    On Aug. 8th it had finished flowering. Most of the achenes were abortive in spite of an extraordinarily favourable summer. Nevertheless it does set seed as more than half of my specimens were seedlings of few years age.
112. *R. pygmaeus* Wahl. — Common.
113. *R. nivalis* L. — Pâtût.
114. *R. sulphureus* Sol. — Ikorfat and Pâtût.
115. *R. hyperboreus* Rottb. — Upernavik Ejland, Kûk, Ikorfat, Alianaitsúnguaq, Pâtût and Atanikerdluk.
116. *R. lapponicus* L. — Sarqaq.
117. *R. reptans* L. — Atanikerdluk and Naujat. In both places sterile.
118. *Thalictrum alpinum* L. — Pâtût.
119. *Papaver radicatum* Rottb. — Common. Hare Ø: Umîvik, new to the flora of that island. — f. *albiflora.* — Naujat.
120. *Cardamine pratensis* L. var. *angustifolia* Hook. — Naujat.
121. *C. bellidifolia* L. — Qarajaq (Vh.); Schades Øer (P.); Atanikerdluk (Nath.).
122. *Arabis alpina* L. — Upernavik Ejland, and on suitable places along the south coast of Nûgssuaq Peninsula. On the north coast only recorded by Vahl at Niaqornat.
123. *A. Holboelli* Horn. — Naujat.
124. *A. Hookeri* Lange. — Ũmánaq, Kûk, Patorfik, Qaersuarssuk.

Though always sporadic in Greenland it is recorded from a good many habitats from the interior of the Nordost Bugt. But, so far as I can ascertain, it has never been collected far from human habitations, and it has most likely been dispersed by man. At Ũmánaq f. inst. it is very common among the houses together with vigorous *Puccinellias*, which in lieu of *Elymus*, are frequently used for straw in the native boots (kamiks). People travelling from Ũmánaq to other places may thus easily disperse both the *Arabis* and the *Puccinellia*'s. Like *Alopecurus alpinus* it is a dung-lover.

125. *A. arenicola* (Rich.) Gel. — Kûk, Patorfik and Pâtût.

126. *Braya purpurascens* (R. Br.) Bunge. — Qaersuarssuq, Pâtût and Atâ.

127. *Eutrema Edwardsii* R. Br. — Kûk, Qaersuarssuk, Qeqertarssuak 71°30′, Svartenhuk Peninsula at 71°22′ and the interior at 71°40′.

From Qaersuarssuk I collected five living specimens in order to cultivate them at the Danish Arctic Station. On July 29th all the specimens had finished flowering. Apparently they stood the voyage well and on my return to Godhavn three weeks later they were planted in a *Cassiope tetragona* heath in "Blæsedalen" on a suitable place where humidity, insolation and the deposition of snow during winter resembled the original habitat.

Some days later I observed that several of the pods had opened and the valves fallen off. On one of them only the valves were still adhered, and, to my surprise they had opened at the top of the siliqua. As all standard works on systematic Botany to which I have had access without exception state as an invariable rule that amongst the *Cruciferæ* the valves open from the base, I think it best to call attention to this abnormality although I have only seen it once on one living specimen, but I have also noticed it on four herbarium specimens: Svartenhuk, Tartûssaq, 1911, Porsild (in the Herb. of The Danish Arctic Station). *Lapponica ponojensis*, Orlow, 67°12′, Kihlman; Qaersuarssuk, 29th Juli 1921, A. E. Porsild; Duckett Cove, Parry, 1823 (in Herb. Haun.).

The last mentioned specimen is probably the type. In Robert Brown's figure (App. XI. Parry Voy. I. tab. A. figs. 16 and 17, drawn by Fr. Bauer and engraved by J. Curtis) the pods are shown opening from the base, but in the text Brown does not mention the dehiscense; he only says: "valvae . . . cortice demum ad margines solubile, in disco arctius adherenti . . ." Fl. Dan. Tab. 2242 shows a silique slightly opened in the top. But, the drawing being bad, it can hardly be ascertained whether this was accidentally or actually seen so by the designer.

In 1922 my specimens in "Blæsedalen" had died, but the seeds had germinated and given rise to several seedlings around the

decayed parents. Next year there were still more seedlings and the oldest had developed the first 2 basal leaves. Of my collection from Kûk several specimens were seedlings with two leaves but they had already developed a very considerable tap-root. Thus *Eutrema* seems to require several years of preparation before it produces flowers.

In addition to my four new stations *Eutrema Edwardsii* is recorded from three places in the Nordost Bugt between 70°36′ and 71°40′, also from Etah 78°20′ and from three places on the East Coast between 72′ and 77°.

My specimens from Qeqertarssuaq and Svartenhuk were collected during a sledge journey in March 1923. The flower-stalks had pierced through the snow. The valves and the partitions had fallen of while the frame seemed to be more resistant.

128. *Cochlearia officinalis* L. — var. *groenlandica* (L.) Gel. — Ikorfat, Atâ. — var. *oblongifolia* (D.C.) Gel. — Hare Ø: Umîvik, Ikorfat, Alianaitsúnguak; var. *arctica* (Schlecht.) Gel. — Alinaitsúnguak.
129. *Draba aurea* M. Vahl. — Upernavik Ejland and Naujat. On both places on a fertile slope with abundant flowers and fruits. Hitherto not found north of 70°.
130. *D. alpina* L. — Upernavik Ejland, Ikorfat, Niaqornat, Pâtût. As a rule not in the low-land.
131. *D. crassifolia* Grah. — Hare Ø (P.), Sarqaq (V.).
132. *D.*[1]) *magellanica* Lam. subsp. *cinerea* (Adams) Ekm. (*Dr. arctica* J. Vahl). — Upernavik Ejland, Kûk, Atâ, Atanikerdluk.
133. *D. magellánica* Lam. subsp. *borea* Ekm. (*D. hirta* Autt.). — Upernavik Ejland, Alianaitsúnguak, Pâtût 670—770.
134. *D. subcapitata* Simm. — Nûgssuaq 70°20′—25′ (P.).
135. *D. rupestris* (R. Br.) Lindbl. — Atâ, Pâtût 670—770 m.
136. *D. Wahlenbergii* Hartm. — Ikorfat. — f. *glabrata.* — Kûk.
137. *Lesquerella arctica* (Wormskj.) Wats. — Very common on most places on the Nûgssuaq Peninsula.
138. *Sedum villosum* L. — Qarajaq (Vh.).
139. *Saxifraga oppositifolia* L. — Common in moist places.
140. *S. Aizoon* Jacq. — Upernavik Ejland, Patorfik and Sarqaq.
141. *S. aizoides* L. — Patorfik, Qaersuarssuk, Ikorfat, Niaqornat, Alianaitsúnguaq and Atâ.
142. *S. tricuspidata* Rottb. — Common.
143. *S. nivalis* L.
144. *S. comosa* Retz.

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[1]) I am indebted to Mrs. El. Ekman for the identification of the white-flowered *Drabas*.

145. *S. groenlandica* L.
146. *S. cernua* L.
147. *S. rivularis* L. These five *Saxifraga*s certainly occur at most of the places visited, but on sandstone, owing to the general dryness and lack of bogs, or, perhaps because of the composition of soil, they are always sporadic.
148. *Sibbaldia procumbens* L. — Upernavik Ejland, Naujat and Atanikerdluk. By Porsild recorded a few times from the head of the Nordostbugt but never from the interior.
149. *Potentilla Egedii* Wormskj. — Qaersuarssuk a little north of its previous range and at Naujat.
150. *P. nivea* L. coll. — Common on suitable places.
151. *P. Vahliana* Lehm. — Hare Ø: Umîvik, Kûk, Ikorfat and Atanikerdluk. As a rule not very common.
152. *P. alpestris* Hall f. coll. — Pâtût and Atanikerdluk. On fertile slopes, rich in humus. On the mainland not north of 69°45′; it is, however, recorded from Hare Ø (70°20′ (P.)).
153. *P. emarginata* Pursh. — Store Dal (P.), Atanikerdluk (Nath., Bg.), Sarqaq (V.).
154. *P. pulchella* R. Br. — Qaersuarssuk, Ikorfat, Alianaitsúnguaq, Pâtût and Atanikerdluk. On the raised marine clays of the north coast it grew very vigorously.
155. *P. Ranunculus* Lange. — Valley at Qeqertaq (Bg.).
156. *Dryas integrifolia* M. Vahl. — Very common.
157. *D. integrifolia* var. *canescens* Simm. — Upernavik Ejland, Kûk, Qaersuarssuk, Alianaitsúnguaq and Atâ. Often common at these localities and in association with the typical species, but, as already stated by Porsild p. 105, there are no intermediate forms. Recorded from Laxefjord 72°30′, Ubekendt Ejland 71°14′, Marraq 70°30′ and Disko Nordfjord by Porsild. Besides only known from Ellesmere Ld.
158. *Callitriche autumnalis* L. — Very abundant in several small lakes at Naujat, and fruiting down to a depth of one meter. On the mainland not recorded north of Jacobshavn 69°13′ (P.) while on Disko it ranges beyond 70° N. Lat.

158a. *C. verna* (L.) Kütz.

In the Herb. Haun. is preserved as specimen collected by Dr. Søren Hansen at Qeqertat 71° Lat. N. July 30th 1888. This interesting specimen evidently has escaped Dr. Kolderup Rosenvinge who in "Conspectus Fl. Groenl. II. Tillæg" gives record of the most interesting of the plants collected by Dr. Hansen. Otherwise known from the south coast of Disco and from Jacobshavn 69°13′ on the mainland.

159. *Empetrum nigrum* L. — Very common.
160. *Chamaenerium latifolium* (L.) Spach. — Common everywhere.
f. *albiflora*.
Atanikerdluk. Also recorded here by NATHORST l. c. 1883: my specimens may be of the same stock.
161. *Epilobium arcticum* Sam. — (Bot. Not. 1922 p. 260).
Dr. G. SAMUELSSON of Stockholm has recently shown that amongst the arctic *Epilobium*s which have formerly been referred to *E. anagallidifolium* (L.) Lam., also, in addition to the latter species, is a new and well distinguished species more closely related to *E. davuricum* Fish. and of more high-arctic range than *E. anagallidifolium*.
According to SAMUELSSON the following specimens from Greenland should be referred to this species: Svartenhuk, Tartûssaq 71°25′, PORSILD, Ignerit Fj. 72°8′, PORSILD, Disko: Igdlorpait 70°15′, PORSILD, Pâtût 2500 F. above sea-level, HARTZ, Kûk "Kome" 70°36′, VANHÖFFEN (by HAUSSKNECHT referred to *E. lactiflorum* Hausskn.) and from the East coast from two places in Scoresby Sound 70°—71°.
162. *Hippuris vulgaris* L. — Atanikerdluk, Naujat and Sarqaq.
163. *Myriophyllum exalbescens* Fern. (Rhodora 1919, p. 120). — Ikerasaq (Vh.).
164. *Pirola grandiflora* Rad. — Very common.
165. *Ledum decumbens* Ait. — Not common. On the south coast of the Nûgssuaq Peninsula only from Pâtût and eastwards. As the preceding.
166. *Rhododendron lapponicum* (L.) Wahl. Not common on the Sandstone areas.
167. *Loiseleuria procumbens* (L.) Desv. — Sarqaq.
168. *Phyllodoce coerulea* (L.) Bab. — Upernavik Ejland, Kûk, Patorfik, Pâtût, Naujat and Sarqaq.
169. *Cassiope tetragona* (L.) Don. — The only species of the *Ericinae* which is fairly common in the sandstone areas.
170. *Cassiope hypnoides* (L.) Don. — Upernavik Ejland and Sarqaq.
171. *Arctostaphylos alpina* (L.) Spreng. — Qeqertaq.
172. *Vaccinium uliginosum* L. var. *microphyllum* Lge. — Common.
173. *Diapensia lapponica* L. — Upernavik Ejland and Hare Ø: Umîvik (new to the flora of the latter island), Kûk, Patorfik and Sarqaq.
174. *Statice sibirica* Turcz. — Upernavik Ejland, Hare Ø: Umîvik, Patorfik, Kûk, Ikorfat, Atâ, Pâtût, Atanikerdluk and Naujat.
175. *Primula mistassinica* Michx. — Atâ. Abundantly flowering and fruiting.

Towards evening the flowers are very fragrant. The scent was so strong that it attracted my attention to the plant.[1])

176. *Mertensia maritima* (L.) Gray. — Upernavik Ejland, Patorfik, Kûk, Ikorfat and Atâ. Common on sandy shores.

177. *Veronica fruticans* Jacq. — Atâ, Atanikerdluk (Stein).

178. *Veronica alpina* L. — Upernavik Ejland, Pâtût, Atanikerdluk, Naujat and Sarqaq. Previously not recorded north of the trading place Nûgssuaq 70°41′ (P.) and, curiously enough, never recorded from the inner parts of Nordostbugten.

179. *Limosella aquatica* L. — Qeqertat 71° (S. H.).

180. *Bartschia alpina* L. — Upernavik Ejland, Ikorfat, Alianaitsúnguaq, Atâ, Pâtût, Naujat, Atanikerdluk and Sarqaq. There is only one previous record from Nordostbugten viz. Qarajaq (Vh.) (one specimen only).

181. *Euphrasia arctica* Lange. — Upernavik Ejland and Atâ.

182. *Pedicularis lapponica* L. — Atâ, Pâtût, Naujat and Sarqaq.

183. *P. flammea* L. — Rather common.

184. *P. hirsuta* L. — As the preceding.

185. *P. lanata* (Willd.) Cham. & Schlecht. — Common.

186. *Pinguicula vulgaris* L. — Atâ and Pâtût.

187. *Utricularia ochroleuca* Hartm. — Ikerasak 70°30′ (Vh.).

188. *Plantago borealis* Lange. — Atâ on the transition-zone between the saline marshes and the dunes.

189. *Campanula uniflora* L. — Upernavik Ejland, Hare Ø: Umîvik and Pâtût only.

190. *C. rotundifolia* L. — Common everywhere.

191. *Erigeron compositus* Pursh. — Common.

192. *E. unalaschkensis* (D.C.) Vierh.

193. *E. eriocephalus* (J. Vahl) Lindm. — Upernavik Ejland, Kûk, Patorfik, Qaersuarssuk, Ikorfat. Common on the Waygat coast.

194. *Antennaria intermedia* (Rosenv.) Porsild. — Pâtût, Atanikerdluk and Naujat.

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[1]) Abromeit l. c. p. 14 writes on *Viscaria alpina*: "Die Blumen verbreiten nach Vanhöffen's Beobachtung einen angenehmen, stark vanilleartigen Duft. Mit Ausnahme von *Viscaria alpina*, *Betula nana* und *Hierochloë alpina* ist nach dem genannten Beobachter sonst keine duftende Pflanze in Umanakdistrikt von ihm bemerkt worden".

This observation is rather misleading: plants with scented flowers in "Umanakdistrikt" are been recorded by several authors, e. g.:

Warming (31): *Ledum*, *Pirola*, *Cassiope tetragona*, *C. hypnoides*, *Vaccinium uliginosum.*

K. Jessen (7): *Ranunculus sulphureus*, *R. nivalis* and *R. lapponicus.*

Fr. J. Mathiesen (12): *Pedicularis lapponica* and *P. lanata.*

According to my own observations *Salix glauca*, *S. groenlandica* and *Rhododendron lapponicum* might safely be added.

195. *Antennaria?* sp. — Upernavik Ejland on the dry edge of a steep slope with *Viscaria alpina*, *Arnica alpina*, *Carex rupestris* and *supina* etc. At this locality I found an *Antennaria* apparently allied to *A. groenlandica.* On my return to The Danish Arctic Station I tried in vain to refer it to one of the known species: it closely resembles an *Antennaria* with some hesitation refered to *A. groenlandica* from Nordre Strømfjord, Ipiutarssuaq 1918 (P. & E.).

I brought the *Antennaria* from Upernavik Ejland and some other critical forms of the genus to Copenhagen in order to compare them with plants in the Herb. Haun. The only conclusion reached was that the Upernavik I. *Antennaria* is certainly distinct both from *A. groenlandica* Porsild and from *A. intermedia* (Rosv.) Porsild.

Unfortunately it would seem that some accident must have happened to my *Antennarias* on their way from Copenhagen to Greenland, as two years have now elapsed and they have not yet arrived. I am thus compelled to postpone a description of this undoubtedly new species until additional specimens can be found.

196. *A. alpina* L. — Upernavik Ejland, Hare Ø: Umîvik, Pâtût. Rather common.

var. *monocephala* D.C. — Pâtût and Atanikerdluk.

197. *A. glabrata* (J. Vahl) Greene. — Singularly enough only recognized from the entrance of Nordostbugt viz. Upernavik Ejland (S. H.) and Ubekendt Ejland and Svartenhuk (P.). Pâtût and Atanikerdluk.

f. *ramosa* nov. f. with 3—4 pedicels 4 to 5 cm. long. — Pâtût.

198. *Gnaphalium supinum* L. — Qeqertaq (Bg.).

199. *Artemisia borealis* Pall. — Commonest of the Compositae on the Nûgssuaq Peninsula. While from Disko has it been recorded a few times only.

200. *Arnica alpina* (L.) Olin. — Common in most places.

f. *inundata* n. f. *Rhizoma horizontaliter repens*, *foliis longioribus et angustioribus*, *85—100 × 3—5 mm.*, *basi badio-violaceis.*

Per totum fere vegetationis tempus inundata, *non nisi annis siccioribus florigera.*

Sarqaq on the clayey banks of a small lake.

201. *Taraxacum phymatocarpum* (R. Br.) J. Vahl. — Patorfik and Alianaitsúnguaq. Hitherto best known from several stations on the Waygat shores.

202. *T. groenlandicum* Dahlst. — Seldom absent on sandy beaches.

203. *T. croceum* Dahlst. — Alianaitsúnguaq and Pâtût near watercourses.

Affinity between the flora of the Nordost Bugt and that of Scoresby Sound on the East Coast of Greenland.

In his well known and often cited paper N. Hartz (5) makes a comparison of the flora of Scoresby Sound with that between the 69 and 71th parallel on the west coast.

His list includes 248 species and 6 varieties of which 243 are said to occur in West Greenland while 143 species only were collected in Scoresby Sound.

In his list of West Greenland plants Hartz followed the "Conspectus Fl. Grl." and thus included several doubtful records, which more recent investigators have excluded from the flora of that district e. g.: *Equisetum silvaticum*, *Salix Myrsinites*, *Alsine groenlandica*, *Saxifraga flagellaris*, *Andromeda polifolia*, *Pedicularis euphrasioides*. Several species of such difficult genera as *Carex*, *Draba* and others have recently been referred to or united with other species, Hartz also includes a few species — *Stellaria media* and *Polygonum aviculare* —, which at least in this region must be considered as non-indigenous (Ruderals), never found far from the settlements.

The actual number of true species and of varieties having a definite geographical distribution in Hartz's list should therefore be reduced to abt. 220 from the west coast.

From W. Greenland 69°—71° we now recognize abt. 252 indigenous species and from the Scoresby Sound region — including Liverpool Coast — but not the inlets north of Jameson Land — 176 species.

Nordost Bugt — Scoresby Sound.

The comparison made by Hartz is, however, at the best rather misleading, because of Disko is included in the W. Greenland area. As is well known S. Disko abounds in warm springs and around these springs the ground is never frozen and, even during the coldest month, it may have a surface temperature from 0° to 17° C.

The peculiar flora of characteristic places in which *Archangelica*, *Alchimilla*, *Orchids* and *Epilobiums* play a conspicuous part occurs on

the mainland much further south. The flora-belt 69°—71°, including Disko, with its 252 species is only surpassed in richness by the flora of the southernmost part of Greenland between 60°—62° (reached by the 10° C. isotherm of July) where 292 indigenous species are recorded.

The flora of the Nordost Bugt seems to me the most appropriate to compare with that of Scoresby Sound on the East Coast. The latitude of these two districts is almost the same; Nordostbugt 70°20′—72°25′ and Scoresby Sound 70°—71°50′, and even in the geographical features there are no very striking differences. In the inner part of both fjords the Archaean rocks are predominant and here the maintrunks of the fjords are split up into numerous tributaries, penetrating deep into the inland ice and uniting inland to form a system of sheltered channels through an archipelago of more or less tabular block-islands. Near the coast on both sides of Greenland the Archaean rock in several places are succeeded by sediments which are usually covered by a considerable thickness of basalt.

From the inland ice numerous glaciers discharge into the fjords where, consequently, icebergs and fragments of icebergs are always plentiful.

The general direction of Scoresby Sound is E—W and it penetrates abt. 300 km. inland and is thus almost twice as long as Sognefjorden in Norway, the longest fjord in Europe. The entrance of the Nordost Bugt is much wider: The name Nordost Bugt is applied to the region which lies between the two peninsulas Svartenhuk and Nûgssuaq. Inside Ubekendt Ejland the bay is divided into two branches, the Ũmánaq Fj. NW—SE and the Karrat Fj. SW—NE. The former penetrates rather more than 150 km. inland. The ice-free land has been estimated to include about 12.000 square kilometres, while Scoresby Sound includes a rather larger area; Jameson Land alone has been estimated by O. Nordenskiöld to include about 5.000 square kilometres.

Climate.

The meteorological records are very few and unsatisfactory. From several places in the Nordost Bugt however series of meteorological observations have been published in the annual reports of the Danish Meteorological Institute. They are rather incomplete but by comparing them to the long and excellent Jakobshavn series, Porsild (21, p. 356) has shown that the temperature is lower during winter while at least in the inner parts of the fjords the temperature of July may even be higher than at Jacobshavn. The mean monthly temperatures of Jacobshavn during 22 years are as follows (33):

I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
— 16.9	18.8	17.2	9.4	0.5	+ 4.6	7.6	6.1	1.3

X.	XI.	XII.	mean for the year
— 3.9	8.5	12.7	— 5.7

On the Danish "Hekla Expedition" observations were made during $10^1/_2$ month at Danmarks Ø in Scoresby Sund about 160 km. beyond the entrance. The monthly mean temperature resembles those recorded at Upernavik at 72°47′ on the W. Coast viz.

I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
— 20.9	23.4	22.7	14.9	4.4	+ 1.5	5.0	4.5	0.4

X.	XI.	XII.	mean for the year
— 4.2	9.8	17.0	— 8.8

or are even still lower. Willaume Jantzen (32, p. 173) writes: "Nov.—April low temperatures, mean —17 and —25.5 C., last part of Sept., Oct. and May —3.0 to —7.0 and June and July 1.0 and 4.5 respectively. During June several days without frost, and during July the mercury only once went below the freezing point".

The annual precipitation is supposed to be nearly the same, — about 250 mm., but owing to the numerous Föhns in Scoresby Sound during winter the snow is partially blown off and in part evaporated. According to Hartz the plants suffer much from drought and even in places where snow always accumulates, the vegetation has generally a xerophile character.

The flora.

As already pointed out, since Hartz published his paper several additions have been made to the flora of both the West and East regions of Greenland. Thus from the Nordost Bugt we now recognize 186 indigenous species and from Scoresby Sound 176 or totally 212 species of indigenous vascular plants. Only ten are peculiar to the east coast while 23 are western species not found on the east coast. The largest number — 150 species — are common: 16 species are known from Scoresby Sound, but, although found on numerous places on the west coast they do not occur in the Nordost Bugt. Thirteen species common to both coasts are recorded from the Nordost Bugt but have not yet been found in Scoresby Sound.

As already stated by Hartz the flora of E. Greenland is nearer related to America than to Europe and of the flora of Scoresby Sound 10 species only are eastern types. The flora of Greenland is generally considered to be a very young one, which reached Greenland subsequent

	E. types pecul. to Sc. S.	W. types pecul. to NO. B.	Types common to Sc. S. & NO. B.	Common typ. + Sc. S. — No. B.	Common typ. + NO. B. — Sc. S.	total
species	10	23	150	16	13	212
p. c.	4.7	10.9	70.7	7.6	6.1	

to the ice-age when all Greenland was covered by ice. If this supposition is correct, having regard to the great length of the coast-line, it is surprising to find 150 species or about 71 p.c. of the total flora common to both regions.

Also if we divide the flora into groups of northern, widely distributed, and southern types the numbers reveal a close agreement:

	total	Northern types	Widely distributed	Southern types
Nordost Bugt	186	47	89	50
p. c.		25	48	27
Scoresby Sound	176	51	76	49
		29	43	28

i. e. the most marked difference is presented by the arctic element.

Together with numerous other valuable notes on the flora of Scoresby Sound Hartz (loc. cit.) has given the maximum vertical range for nearly all the species of vascular plants, and I have tried to compare these ranges with those known from the west coast of Greenland, especially those within the same parallels. Unfortunately our available information on this point is still very incomplete and all such records can only he considered as preliminary.

In Lange's: Conspectus Fl. Grl. numerous records of this kind are given, but, as remarked by Lange (11) himself, mostly without any information as to the latitude or local conditions. As the absolute maximum, vertical range cannot reasonably be expected to be the same on the latitude of Julianehaab and of Upernavik, such records are consequently not of much value.

In the summary given below I have tried to compile the records of vertical ranges of vascular plants from W. Greenland and, in a separate column, those from Scoresby Sound. My sources have principally been Lange's: Conspectus with appendices of which only the last, edited by Rosenvinge (23), gives any information on latitude etc., also Warming (30), Rink (22), Hartz (4, 5) and Porsild (16). In brackets I

have incorporated a few ranges without latitude. Altitudes given in *Italics* are new ranges for which I am responsible.

Vertical ranges of plants.

Southern and lowland types.

	Scoresby Sd.	West-Greenland	
Lycopodium alpinum	314	(785)	
Calamagrostis neglecta	940	(630)	
Poa alpina	940	*770*	70°
		1470	62½°
Festuca rubra	750	(314)	
Carex Macloviana	625	*300*	*70°*
		380	61°
C. lagopina	690	(565)	
C. scirpoidea	785	*770*	*70°*
Juncus castaneus	625	(125)	
J. arcticus	625	380	61°
J. trifidus	785	*500*	*70°*
		1290	63°
Luzula spicata	314	*770*	*70°*
		940	61°
Rumex Acetosella	785	346	68°
Sagina Linnaei	785	250	61°
Cerastium trigynum	940	780	70°
		1470	62½°
Viscaria alpina	785	(625)	
Thalictrum alpinum	314	*770*	*70°*
Arabis alpina	1255	940	70°
		1470	62½°
A. Holboellii	940	*300*	*70°*
		630	S. Grl.
Draba aurea	785	*200*	*70°*
		(256)	
Rhodiola rosea	785	c. 200	N. Grl.
		940	S. —
Saxifraga Aizoon	314	(785)	
Sibbaldia procumbens	940	(850)	
Potentilla alpestris	500	*500*	*70°*
		1470	62½°
Arctostaphylos alpina	720	c. *100*	*70°*
Veronica alpina	940	*770*	*70°*
		(850)	

	Scoresby Sd.	West-Greenland	
V. fruticans	940	c. *500*	*69°*
		(535)	
Euphrasia arctica	785	c. *500*	*70°*
		535	S. Grl.
Pedicularis lapponica	690	(630)	
Pinguicula vulgaris	625	500	61°
Taraxacum croceum	940	(500)	

Widely distributed types.

Equisetum variegatum	1255	785	70°
E. arvense	1255	940	70°
Woodsia ilvensis	1320	*880*	*70°*
Cystopteris fragilis	1255	*500*	*70°*
Lycopodium Selago	940	(1300)	
Hierochloë alpina	1320	1000	70°
		1470	$62^1/_2$°
Calamagrostis purpurascens	1320	785	70°
Trisetum spicatum	1255	*910*	*70°*
Phippsia algida	785	940	70°
Poa pratensis	1255	*960*	*70°*
P. arctica	1570	(500)	
P. glauca	1570	1255	70° Disko
Festuca ovina	940	1255	70° —
Eriophorum Scheuchzeri	850	785	70°
E. angustifolium	750	785	70°
Cobresia Bellardii	626	500	70°
		535	S. Grl.
C. bipartita	125	(785)	
Carex nardina	1570	*930*	*70°*
		1420	S. Grl.
C. rigida	1320	1470	$62^1/_2$°
C. supina	785	?	
C. pulla	625	?	
Juncus biglumis	785	*770*	*70°*
Luzula confusa	1570	*960*	*70°*
		1470	$62^1/_2$°
Tofieldia palustris	940	*675*	*70°* Disko
Salix herbacea	940	*770*	*70°*
		1470	$62^1/_2$°
S. groenlandica	1570	*770*	*70°*

	Scoresby Sd.	West-Greenland	
S. glauca	815	960	70°
		1470	$62^1/_2$°
Betula nana	940	*500*	*70°*
		(785)	
Oxyria digyna	940	940	70°
		1470	$62^1/_2$°
Polygonum viviparum	1255	*960*	*70°*
Sagina caespitosa		*910*	*70°*
Minuartia verna	1320	1420	$70^1/_2$°
Stellaria longipes	785	*930*	*70°*
Cerastium alpinum	1570	1255	70° Disko
		1470	$62^1/_2$°
Silene acaulis	1570	1420	$70^1/_2$°
		1470	$62^1/_2$°
Ranunculus pygmaeus	500	*770*	*70°*
		(1280)	
R. hyperboreus	830	780	70°
Papaver radicatum	1570	1420	$70^1/_2$°
		1500	63°
Cardamine bellidifolia	1570	700	69°
		1470	$62^1/_2$°
Draba nivalis	1570	*910*	*70°*
		(940)	
D. magellanica subsp. *borea*	940	*910*	*70°*
Saxifraga oppositifolia	1570	*770*	*70°*
		1470	$62^1/_2$°
S. aizoides	125	(470)	
S. groenlandica	1570	1420	$70^1/_2$°
		1470	$62^1/_2$°
S. nivalis	1570	*930*	*70°*
		1470	$62^1/_2$°
S. rivularis	940	*910*	*70°*
		1470	$62^1/_2$°
S. cernua	1255	940	70°
		1470	$62^1/_2$°
Dryas integrifolia	910	*930*	*70°*
Empetrum nigrum	910	*770*	*70°*
Chamaenerium latifolium	1255	*770*	*70°*
Rhododendron lapponicum	1320	(785)	
Cassiope hypnoides	?	1470	$62^1/_2$°
Myrtillus uliginosa var. *microphyllum*	1320	*770*	*70°*
Diapensia lapponica	?	(880)	

	Scoresby Sd.	West-Greenland	
Statice sibirica	?	*675*	*70°* Disko
		1290	62½°
Pedicularis flammea	940	*770*	*70°*
Campanula rotundifolia	1160	*770*	*70°*
Antennaria alpina	1255	*930*	*70°*
		1470	62½°

Northern types.

	Scoresby Sd.	West-Greenland	
Alopecurus alpinus	625	780	70°
Arctagrostis latifolia	625	*300*	*70°*
Puccinellia Vahliana	?	*770*	*70°*
Festuca brevifolia	?	1420	70½°
Carex rupestris	940	*770*	*70°*
C. misandra	1100	*910*	*70°*
Luzula nivalis	?	*960*	*70°*
Tofieldia coccinea	940	300	71°
		c. 500	67°
Melandrium apetalum	1255	*770*	*70°*
M. affine	1320	*910*	*70°*
		(590)	
M. triflorum	565	*770*	*70°*
Ranunculus sulphureus	785	*770*	*70°*
R. affinis	?	*770*	*70°*
Braya purpurascens	?	*770*	*70°*
Draba alpina	940	1255	70° Disko
		1255	S. Grl.
D. magellanica subsp. *cinerea*	940	1420	70½°
		1380	S. Grl.
Lesquerella arctica	470	*770*	*70°*
		(940)	
Saxifraga comosa	?	*770*	*70°*
		1255	S. Grl.
S. tricuspidata	—	1420	70½°
Potentilla nivea	1320	*770*	*70°*
		1470	62½°
P. Vahliana	—	1420	70½°
P. emarginata	1570	*960*	*70°* Disko
		(940)	
Epilobium arcticum	?	780	70°
Pirola grandiflora	1320	*930*	*70°*
		1470	62½°

	Scoresby Sd.	West-Greenland	
Cassiope tetragona	1570	*910*	*70°*
Pedicularis hirsuta	1320	*770* (785)	*70°*
P. lanata	—	*770*	*70°*
Campanula uniflora	1570	940 1290	72° S. Grl.
Erigeron compositus	940	*770* (910)	*70°*
E. eriocephalus	1255	*770* (880)	*70°*
Arnica alpina	1255	*770*	*70°*
Taraxacum phymatocarpum	1255	675	70° Disko

Snow- or Firnline.

Warming (30, p. 82) has compiled records of the altitude above sea-level at which the perpetual snowline occurs in Greenland. From W. Greenland the statements vary considerably; the average may be taken to lie between 600—950 m. No very pronounced difference is found as we travel from the extreme South until we reach localities, which lie far to the North, a fact which requires explanation: as suggested by Warming the reason may be decreasing precipitation accompanied by increasing evaporation as we pass towards the North. Since the publication of Warming's paper, Drygalski (3, p. 247 & 303 ff.) has stated that the snowline on the Qarajaq Glacier and on the north-east side of the Nûgssuaq peninsula in W. Greenland, a little north of the 70th parallel, occurs between[1]) 8—900 m. above sea-level. In E. Greenland Koch and Wegener (8, p. 57) found the snow-line on Germania Ld. 77° Lat. N. at 3—500 m. while on Dr. Louises Ld., hardly more than 100 km. beyond the coast, it was found to be about 1000 m. above sea-level. Measurements by means of captive baloons showed no decrease in temperature below about 300 m. Within the 70—75th parallels Payer (15, p. 564) places the snow-line at 9—1200 m. above sea-level.

Hartz unfortunately gives no records of the snow-line altitude, but, from remarks made by him and other observers it would appear that towards the head of the fjord in Scoresby Sound the snow-line occurs at a still greater height. This is consistent with, and may be the reason for, the occurrence of a much greater number of species at a higher altitude on the East of Greenland. Thus in E. Greenland from 1000—1600 m. not less than 43 species pass the 1000 metre line, while

[1]) On Aug. 25th when the highest absolute temperature was measured in the lowland, Drygalski found the 0° C. isotherm 860 m. above sea-level.

in W. Greenland (about the 70th parallel) only 13, and in the whole of West Greenland (from 60—80th) 37 species occur above the 1000 m. line.

If then the snow-line in Scoresby Sound lies at a much greater height than on the W. Coast, it is only natural that arctic types of plants should also range higher since the latest expeditions have shown that vascular plants will thrive on icefree ground as far north as the land extends towards the pole. It is more surprising to find that in Scoresby Sound several plants, which in W. Greenland are southern and lowland types, reach very considerable altitudes. In this group we have: *Carex Macloviana* (625 m.); *Juncus trifidus*; *Rumex acetosella*; *Sagina Linnaei*; *Viscaria alpina* (all 785 m.); *Arabis alpina* (1255 m.); *A. Holboelli* (940 m.); *Draba aurea* and *Rhodiola rosea* (785 m.); *Arctostaphylos alpina* (720 m.); *Veronica fruticans* (940 m.); and *Pinguicula vulgaris* (625 m.), all of which are very rare in W. Greenland in the neighbourhood of the 70th parallel on the mainland, and, even on South Disko they are restricted to the most favourable stations in the lowland.

Conclusion.

Of the two coasts of Greenland the west coast may safely be considered by far the best known both as regards the vegetation and the general climate features. It may safely be assumed that the flora of the Nordost Bugt requires a period of growth, at least from the end of May to the end of September with a mean temperature in July from 6—8° C. for the coastal and inland districts respectively.

As our present information on the flora of Scoresby Sound, at least in the respect of the inland districts, rests on the observations of one botanist only, made during one season and under most unfavourable conditions, we may safely predict that further investigations will prove that the flora is not poorer than that of the Nordost Bugt.

This prediction is justified by the two considerations:

1) the number of southern species known to occur in Scoresby Sound is but one species less than in the Nordost Bugt;
2) nearly all southern types in Scoresby Sound have a greater range vertically.

We may safely suppose that our present conception of the climatic conditions of the Scoresby Sound region, resting upon one single series of observations, is far from giving a correct idea. The flora of this Eastern region proves, that the sum of the temperatures from May to September cannot be less than in the Nordost Bugt of West Greenland and that consequently the isotherm for 8° C. of July probably reaches Scoresby Sound.

Two floral districts of the Nordostbugt.

The strongly marked difference in West Greenland between the floras of the coast-land and of the head of the fjords has been touched upon by several botanists, e. g. Rosenvinge (24), Porsild (19, 20), Kruuse (9), Hartz (4) and others. On the other hand climatological data are very scarce and from a typical fjord we have but one set of data cited by Rosenvinge (24, pp. 94—95) from Godthaabsfjord where the mean temperature of July in a distance of only 50 km. rises 1.2° C.

In spite of the incompleteness of the meteorological data[1]) from the Nordost Bugt they provide two interesting pieces of informations:

1) that generally speaking the climate of the Nordost Bugt has a more continental character than that of Jacobshavn at the head of the more open Disko Bugt; i. e. colder winter and rather warmer summers and, in addition, less fog and precipitation.
2) that there is also a pronounced difference between the climate of the outer coastal area facing the open Davis Strait, represented by data from Igdlorssuit at Ubekendt Ejland, and that of the inner area represented by Ikerasak near the inland ice. In the latter area the mean of July may even rise 2° higher than at Igdlorssuit.

In the following table I have tried to express in figures the influence of climatic differences on the composition of the floras of the two areas. Our incomplete knowledge creates a difficulty and I have therefore chosen to select a few of the best known local floras within each area[2]). The flora of the outer area is thus represented by: 1) the south coast of Svartenhuk peninsula, 71°25′, by 2) Igdlorssuit 71°14′, by 3) the trading place Nûgssuaq, 70°38′, by 4) Hare Ø, while the inner area is represented by 1) the south coast of Upernavik Ejland, 71°10′, by 2) Ikerasak and environs, circa 70°30′, by 3) Naujat, 70°, at the south coast of the Nûgssuaq peninsula.

It must here be mentioned that all the localities in the outer area lie within the basalt region, while within the inner area gneiss, sandstones as well as basalt are present. This may well produce some discrepancy for example, as to the acidity of the soils, and I have no doubt that, at least a few species do not occur on basalt at all and vice versa. Still I do not think this will affect the actual numbers to any great

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[1]) Se further p. 183.

[2]) In this list 7 species do not occur: they are all from stations on the boundary between the two areas. The species are: *Potentilla Egedii*, *Limosella aquatica* and *Plantago borealis* all southern types; *Poa abbreviata*, *Ranunculus affinis* and *Taraxacum phymatocarpum*, northern types, and *Carex holostoma*, a widely distributed type. Thus the total number of species in the two areas should be 194.

extent, and at any rate this consideration may be neglected as the information is still very meagre.

The numbers are given below in tabular form showing, as might be expected, that a very strong contingent of southern types follows the isotherm of July which evidently does not follow the parallels of latitude but runs in the N.S. direction parallel to the inland ice:

Distribution of plants in W. Greenland 70°—71°30 N. Lat.

	peculiar to outer area		peculiar to inner area		common		total	
	number	p. c.	number	p. c.	number	p. c.	number	p. c.
species widely distributed in West Greenland........	2	1	7	4	74	40	83	45
northern types............	8	4	4	2	33	18	45	24
southern types............	2	1	30	16	27	14	59	31
total...	12	6	41	22	134	72	187	

Of the 59 southern species the following 27 are common to both areas: *Lycopodium annotinum*, *Calamagrostis neglecta*, *Poa alpina*, *Festuca rubra*, *Elymus arenarius* var. *villosus*, *Heleocharis acicularis*, *Carex lagopina*, *C. alpina*, *C. scirpoidea*, *Juncus arcticus*, *Luzula spicata*, *L. frigida*, *Minuartia biflora*, *Cerastium trigynum*, *Ranunculus lapponicus*, *Thalictrum alpinum*, *Arabis alpinum*, *Sibbaldia procumbens*, *Potentilla alpestris*, *Hippuris vulgaris*, *Phyllodoce coerulea*, *Veronica alpina*, *Euphrasia arctica*, *Pedicularis lapponica*, *Pinguicula vulgaris*, *Antennaria glabrata* and *Taraxacum groenlandicum* while two, *Carex subspathacea* and *Taraxacum croceum*, are peculiar to the outer area only, and, not less than 30 to the inner area: *Botrychium Lunaria*, *Sparganium submuticum*, *Potamogeton filiformis*, *P. groenlandicus*, *Triglochin palustre*, *Alopecurus aristulatus*, *Agrostis borealis*, *Agropyron violaceum*, *Scirpus caespitosus*, *Carex capitata*, *C. Maclowiana*, *C. microglochin*, *Juncus trifidus*, *Rumex acetosella*, *Viscaria alpina*, *Montia lamprosperma*, *Ranunculus confervoides*, *R. reptans*, *Arabis Holboelli*, *Draba aurea*, *Saxifraga Aizoon*, *Sedum villosum*, *Potentilla Egedii*, *Callitriche autumnalis*, *Myriophyllum albescens*, *Primula mistassinica*, *Veronica fruticans*, *Bartschia alpina*, *Utricularia ochroleuca*, *Antennaria intermedia*.

Of the 43 northern types the following 33 are common to both areas: *Alopecurus alpinus*, *Arctagrostis latifolia*, *Puccinellia Vahliana*, *P. angustifolia*, *Carex ursina*, *C. stans*, *C. ustulata*, *C. rupestris*, *C. misandra*, *Luzula nivalis*, *Tofieldia coccinea*, *Arenaria ciliata* subsp. *norvegica*, *Melandrium apetalum*, *M. affine*, *M. triflorum*, *Lesquerella arctica*, *Draba alpina*, *D. magellanica* subsp. *cinerea*, *Saxifraga tricuspidata*, *S.*

comosa, *Potentilla nivalis*, *P. Vahliana*, *P. emarginata*, *P. pulchella*, *Dryas integrifolia* var. *canescens*, *Pirola grandiflora*, *Cassiope tetragona*, *Pedicularis hirsuta*, *P. lanata*, *Campanula uniflora*, *Erigeron compositus*, *E. eriocephalus* and *Arnica alpina*.

Peculiar to the outer area are 8: *Deschampsia caespitosa* var. *pumila*, *Dupontia Fisheri*, *Minuartia stricta*, *Ranunculus nivalis*, *R. sulphureus*, *Eutrema Edwardsii*, *Draba subcapitata* and *Epilobium arcticum*, while only 4 are peculiar to the inner area: *Dryopteris fragrans*, *Woodsia glabella*, *Festuca brevifolia* and *Braya purpurascens*.

Of the 83 species of the widely distributed type 74 are common to both areas: *Cystopteris fragilis*, *Woodsia ilvensis*, *Equisetum variegatum*, *E. arvense*, *Lycopodium Selago*, *Hierochloë alpina*, *Calamagrostis purpurascens*, *Trisetum spicatum*, *Phippsia algida*, *Poa pratensis*, *P. arctica*, *P. glauca*, *Puccinellia phryganoides*, *P. vaginata*, *Festuca ovina*, *Eriophorum Scheuchzeri*, *E. angustifolium*, *Cobresia bipartita*, *Carex nardina*, *C. incurva*, *C. glareosa*, *C. rariflora*, *C. rigida*, *C. pedata*, *C. pulla*, *Juncus castaneus*, *J. biglumis*, *J. triglumis*, *Luzula confusa*, *Tofieldia palustris*, *Salix glauca*, *S. groenlandica*, *S. herbacea*, *Betula nana*, *Oxyria digyna*, *Polygonum viviparum*, *Koenigia islandica*, *Sagina intermedia*, *S. caespitosa*, *Honckenya peploides*, *Minuartia verna*, *Stellaria humifusa*, *S. longipes*, *Cerastium alpinum*, *Silene acaulis*, *Ranunculus pygmaeus*, *R. hyperboreus*, *Papaver radicatum*, *Cardamine bellidifolia*, *C. pratensis*, *Arabis arenicola*, *Cochlearia officinalis*, *Draba nivalis*, *D. magellanica* subsp. *borea*, *D. rupestris*, *Saxifraga oppositifolia*, *S. nivalis*, *S. groenlandica*, *S. cernua*, *S. rivularis*, *Dryas integrifolia*, *Empetrum nigrum*, *Chamaenerium latifolium*, *Cassiope hypnoides*, *Rhododendron lapponicum*, *Ledum decumbens*, *Vaccinium uliginosum*, *Diapensia lapponica*, *Statice sibirica*, *Mertensia maritima*, *Pedicularis flammea*, *Campanula rotundifolia*, *Erigeron unalaschkensis*, *Antennaria alpina* and *Artemisia borealis*, while but two, *Draba crassifolia* and *Saxifraga aizoides*, are peculiar to the outer area, and 7, *Woodsia ilvensis*, *Cobresia Bellardii*, *Carex capillaris*, *C. supina*, *Arabis Hookeri*, *Draba Wahlenbergii* and *Loiseleuria procumbens* are peculiar to the inner area.

Den danske Arktiske Station, March 1st 1924.

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III.

KØNSDELENES BYGNING OG UDVIKLING

HOS

KOENIGIA ISLANDICA L.

AF

O. HAGERUP

1926

KOENIGIA er en meget lille og spinkel Polygonacé, der habituelt nærmest vil kunne sammenlignes med vor hjemlige *Centunculus*, og blandt andet er mærkelig ved at være **den nordligst forekommende eenaarige Fanerogam**; paa Grønlands Vestkyst er den saaledes fundet helt op til 76°30′ (Thule) og langs Østkysten til 74°30′. Paa sine nordligste Lokaliteter vokser den i tætte Tuer især i Nærheden af menneskelige Boliger og Affaldspladser, hvor Jordbunden maa indeholde rigelige Mængder af kvælstofholdige Forbindelser. Paa Færøerne (61°) og andre sydligere Lokaliteter findes Planten derimod ofte paa golde grusede Steder, hvor Individerne vokser spredt mellem Smaastenene; og disse Forskelligheder i Voksestedet betinger atter en betydelig habituel Forskel paa Individer fra forskellige Breddegrader, idet baade Forgrening og Bladform kan variere.

Saa snart Sneen er smeltet, spirer de overvintrede Frø — under Polarkredsen i Vestgrønland — i Slutningen af Juni eller Begyndelsen af Juli, og en Maaned senere (Slutningen af Juli) iagttages de første udfoldede Blomster. Atter en Maaned senere er Frugterne ved at være modne. Alt efter Breddegraden kan Planten altsaa fuldende sit hele Livsløb paa 2—3 Maaneder, og dens Lidenhed er aabenbart et værdifuldt Vaaben i Kampen for Tilværelsen og en nødvendig Betingelse for, at den i den korte, arktiske Sommer kan gennemføre sin hele Udvikling som den mest fordringsløse af alle Therofyter.

De vegetative Organers Morfologi er allerede undersøgt grundigt af Juel, til hvis Arbejde jeg derfor blot skal henvise.

De unge Blade er alle forsynede med Ochrea, der omgiver Aksel-Knoppen, som enten kan udvikle sig til en vegetativ Gren eller en kort faablomstret Stand, hvis nedre Blades Plade er delvis eller helt reduceret; Forbladene for de enkelte Blomster er saaledes blot tilstede som en tynd Hinde, der kun er eet Cellelag tyk, og som omgiver Blomsten helt.

Blomsten er gennemført trimer og har (Fig. 1) (med Undtagelse af de manglende Kronblade) det primitiveste Polygonacé-Diagram, hvoraf de øvrige indenfor denne Familie forekommende Diagrammer vil kunne afledes, idet det i det store og hele er identisk med *Pterostegia's* **Diagram** (Eichler).

Fig. 1.
Diagram af en Blomst.
S, Støtteblad;
1, *2*, *3*, Bægerblade.

I Regelen er **Bægeret** orienteret saaledes, at det mediane Bægerblad vender bagtil; men undertiden findes ogsaa Diagrammer med det mediane Bægerblad vendende fortil ganske som hos Monocotyledonerne. Bægerbladenes Rande dækker hinanden, saa deres relative Aldersfølge kan bestemmes, saaledes som vist i Figuren. Bægerbladene er hvidliggrønne; og naar Blomsten er »udsprungen«, er de stjerneformigt udbredte en enkelt Dag; men senere er de for stedse lukkede tæt sammen og omgiver saaledes den modne Frugt. Bægerbladene er stillede paa et skaalformet Underbæger, hvorved Blomsten altsaa bliver omkringsædig (Fig. 2).

Ved Basis bærer Bægerbladene paa deres Midte hver en skinnende gul Dannelse (Fig. 2 *s*), der ligner et Nektarium, og som let iagttages paa den udfoldede Blomst. Det er den ydre Kreds af **Støvblade**, der saaledes er reducerede til Staminodier. Ud for Mellemrummene mellem Bægerbladene staar 3 fuldt udviklede Støvblade med omtrent kugleformet Støvknap og en Støvtraad, der netop er saa lang, at Støvknappen kommer til at staa i samme Højde som Arrene. Støvbladene er noget bevægelige, og navnlig kan Knappen bevæges ved Hjælp af et Hængsel bestaaende af nogle store, vandholdige Celler paa Knapbaandets Bagside (Fig. 2*s*), saa Selvbestøvning er meget paalidelig og regelmæsig. Støvknappens Væg er 3 Cellelag tyk; Epidermens Celler er store og vandholdige; derunder ligger et Lag mekaniske Celler, hvis Vægge har skrueformede Fortykkelseslister; og endelig er Støvsækken omgivet med et Tapetlag af næringsholdige Celler, der svinder ind, efterhaanden som Pollenkornene modnes.

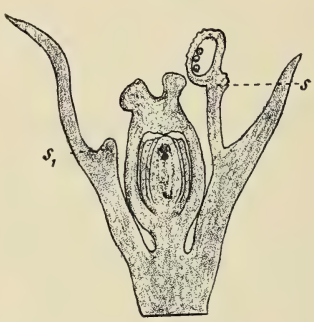

Fig. 2.
Længdesnit af en Blomst.
s_1, Staminodium.
s, Støvblad. $^{40}/_1$.

I hvert af de 4 kugleformede Støvsække anlægges sædvanligt kun

4 Pollenmoderceller; og dette ringe Antal forvolder betydelige praktiske Vanskeligheder, naar man ønsker at følge Pollenkornenes Udvikling, idet hver Støvsæk altsaa kun kommer til at rumme omkring 16 Pollenkorn. Det er derfor kun 2—3 Gange lykkedes mig at finde en heterotypisk Metafase beliggende saaledes, at jeg med fuld Sikkerhed har kunnet tælle *14 Kromosomer* (Fig. 3 a), der er korte, tykke og noget kantede, hvorimod Plantens diploide Generation har lange, traadformede Kromosoner (Fig. 6 *b*). De ved Reduktionsdelingen opstaaede Tetrader opløses snart, saa de enkelte Pollenkorn kommer til at ligge frit i Støvsækkene uden indbyrdes Forbindelse. Den første Deling i det unge Pollenkorn er vist i Fig. 3 *b*; der opstaar herved en større vegetativ Celle og en mindre, generativ, der er linseformet, og hvis Plasma afgrænses ved et farveløst Lag, der lettest tydes som en Slags Cellevæg. Den generative Kærne deler sig atter i to, saaledes at det modne Pollenkorn (Fig. 3 *c*) kommer til at indeholde 2 aflangt tenformede Spermakerner, som farves helt sorte med Jernhæmatoxylin, hvorved de stedse er lette at skelne fra alle Kønsapparatets øvrige Kerner, saaledes f. Ex. ogsaa fra Pollenkornets større, runde »vegetative« Kerne. Det modne Pollenkorns Yderhinde er tæt klædt med lange, fine, hyaline Pigge, som antagelig sætter Pollenkornet i Stand til at stikke sig fast i Arret, der ganske mangler Papiller. Der er omkring 16 Spirehuller i Extinen, og saa snart Pollenkornet sidder paa Arret, spirer det, og Pollenrøret borer sig ned gennem Griffelen, hvor det er let at paavise ved Farvning med Orange. Ofte løftes Pollenkornet helt ud fra Arret af Pollenrøret, som rummer alle det nu tomme Pollenkorns 3 Kerner, der stadig kommer nærmere og nærmere ned mod de hunlige Kønsceller.

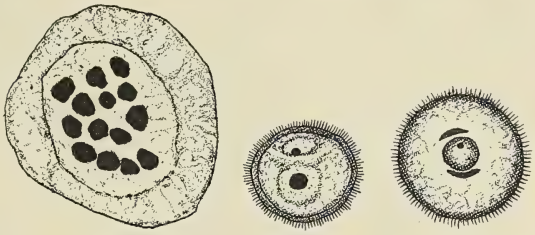

Fig. 3 *a*. Fig. 3 *b*. Fig. 3 *c*.

a. Heterotypisk Metafase med 14 Kromosomer. $^{2300}/_{1}$. *b*. Ungt Pollenkorn med 2 Kerner. *c*. Modent Pollenkorn med een stor „vegetativ“ Kerne og 2 mindre hanlige Kerner. $^{700}/_{1}$.

Der er kun eet **Frugtblad** med eet ret, tokappet Æg, der anlægges som en kugleformet Vorte samtidig med, at selve Frugtbladet omvokser det som en ringformet Valk. I Begyndelsen er Æggets Krop længere end Frugtbladet; og naar Længdeforskellen er omtrent som vist i Fig. 4 *a*, foregaar Reduktionsdelingen i den hunlige Archesporcelle, der ligger eet Cellelag under Epidermis. Samtidig er Støvbladene saa vidt udviklede, at ogsaa de hanlige Archesporceller er i Reduktionsdeling; og tillige ses nu det første Anlæg til Integumenterne som en

ringformet Vold ved Basis af Ægkroppen. Ved en ringformet Fure deles denne Vold i to, der er de første spæde Anlæg til de 2 Æghinder (Fig. 4b). Frugtbladet er nu naaet helt op om Ægkroppen, dets Rande vokser sluttelig sammen og forlænger sig til en Griffel med 3 Ar.

Den fuldt udviklede Frugtknude er ægformet og sidder paa en kort Stilk (Fig. 2). Væggen bestaar af 4 Lag Celler, hvoraf det inderste hærdner og omgiver Ægget som et beskyttende Lag, der kun er afbrudt ud for Mikropylen. De to Integumenter bestaar hver af kun 2 Lag Celler; de er saa korte, at de ikke dækker Spidsen af Ægkroppen, hvorved der altsaa bliver en usædvanligt stor Mikropyle, som ligger ganske tæt op til Griffelens underste Del, hvor Pollenrøret bryder igennem; der er typisk Porogami. Tilmed ligger der ofte i selve Ægkroppens Spids nogle plasmarige Celler, som tager stærkt mod Hæmatoxylin, og som maaske har en særlig Funktion: At »lede« eller ernære Pollenrøret? Ofte er Pollenrøret — eller dog Rester af dette — let at se i Mellemrummet mellem Frugtknudens Væg og Mikropylen.

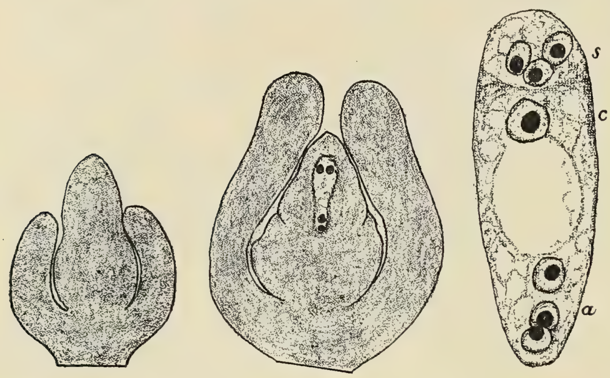

Fig. 4*a*. Fig. 4*b*. Fig. 4*c*.

Fig. 4. *a* og *b*. Unge Frugtblade med de første Anlæg til Integumenter. $^{150}/_{1}$. *c*. Ung Kimsæk med: Centralkerne *c*; Antipoder *a* og Synergider *s*. $^{600}/_{1}$.

Den hunlige Archesporecelle anlægges eet Cellelag under Ægkroppens Epidermis; den videre Udvikling foregaar meget hurtigt paa sædvanlig Maade: Der dannes ved fortsatte 2-Delinger (Fig. 4 *b*) en ung, endnu ikke befrugtningsdygtig Kimsæk med 8 Kerner, der ligger i 2 Grupper paa hver 4 Kerner, i hver sin Ende af Kimsækken. Af den nederste Gruppe bliver de 3 Celler liggende (Antipoder), medens den fjerde vandrer opad til lidt over Midten af Kimsækken, hvor den efter Sammensmeltning med Ægkernens Søstercelle danner den store, diploide Centralkerne. Denne Sammensmeltning er saa fuldstændig, at der kun findes een Nucleolus (Fig. 4 *c*); og Centralkernens Dobbeltnatur kan kun paavises ved at følge dens Udviklingshistorie. Af de resterende 3 Kerner i den øvre Cellegruppe tiltager den nederste, Ægcellen, i Størrelse paa Bekostning af de 2 øvrige Celler, Synergiderne. Naar Kimsækken er saa vidt udviklet, at den er befrugtningsdygtig (Fig. 5,) er baade Synergider og Antipoder ganske reducerede, men dog lette at paavise ved Farvning med Hæmatoxylin; paa dette Stadium er der da kun 2 levende

Kerner i Kimsækken: Centralkernen og Ægkernen, der begge er meget store; de er aabenbart voksede paa Bekostning af Kimsækkens øvrige Kerner. Samtidig er Kimsækkens Omfang blevet saa stort, at den udfylder omtrent Halvdelen af Ægkroppen, hvis Celler bliver trykkede sammen og dræbt; og deres Kerner ligger som sorte Masser udenfor Kimsækkens ydre Begrænsning.

Skønt jeg har undersøgt langt over 100 Blomster, er det kun een Gang lykkedes mig at finde et tilstrækkeligt anskueligt Befrugtningsstadium; dette er afbildet i Fig. 5. Det paagældende Snit, der var $^{12}/_{1000}$ Milimeter tykt, rummede alt det i Figuren tegnede med Undtagelse af Ægkernens ene Halvdel, som laa i Nabosnittet. Ægcellens ydre Begrænsning er saa skarp, at den kommer til at minde om en Cellevæg; ogsaa Kernen er tydeligt forsynet med en Hinde og besidder et iøjnefaldende mørkt farvet Kernelegeme med Lufthule. Ved den hunlige Kernes Hinde ses den mørke hanlige Kerne s, der har trukket sig sammen og ikke længer er aflangt tenformet, som da den laa i Pollenkornet (Fig. 3 *c*); tillige er den blevet noget større og maa altsaa have optaget Næring under sit Ophold i de hunlige Kønsveje. Den anden Spermokerne s_1, der nu ligger midt i Centralkernen, har derimod beholdt sin oprindelige aflange og krumme Form og er omgivet af talrige mørkt farvede Korn, hvilket maaske bør tydes som en begyndende Opløsning. Centralkernen er usædvanligt stor og er mærkeligt nok nu forsynet med 2 Kernelegemer, et større og et mindre; før Befrugtningen er der aldrig mere end eet Kernelegeme; de 2, der nu optræder, tages bedst som et Udtryk for Centralkernens Dobbeltnatur. Bortset fra Nucleolerne er Kernernes Indhold usædvanligt klart i Befrugtningsstadiet; der findes dog nogle mørke Kromotinkorn spredt rundt om i Kernerne. Befrugtningsprocessen er altsaa en typisk „Doppelbefrugtning".

Fig. 5. „Doppeltbefrugtning". *s*, Sædkerne beliggende ved Ægkernens Hinde. s_1, den anden hanlige Kerne liggende midt mellem Centralkernens to Nucleoler. $^{500}/_1$.

Efter Befrugtningen deler Centralkernen sig saaledes, at der opstaar en Mængde frie Celler, der først ligger som et tyndt Lag langs Kimsækkens Periferi. De sidste af Ægkroppens Celler fortrænges efterhaanden ganske, og der opstaar tillige Vægge mellem de oprindeligt frie Kerner; og slutteligt er Ægget helt fyldt med den paa denne Maade opstaaede Endosperm.

Selve Ægcellen deles først (Fig. 6 *a*) ved en vandret Væg *b* i 2

Celler; af disse udvikler den øverste sig til Kimblade og Kimknop, idet den første Delingsvæg, som er lodret (Fig. 6 *b*) danner den første Adskillelse mellem de 2 Kimblade. Den nederste af Ægcellens 2 Døtreceller deles derpaa atter vandret i 2 Celler, hvoraf den øvre *bc* bliver til største Delen af den hypocotyle Akse. I Fig. 6 *c* ses det endeligt, at Kimens nederste Celle atter har delt sig ved en vandret Væg *d;* Stykket *cd* indgaar senere i Rodspidsen, medens den under *d* liggende Celle deles videre i nedadgaaende Retning og bliver til Rodhætte og nederst Suspensor.

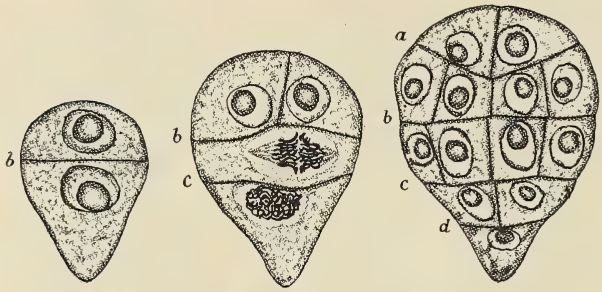

Fig. 6*a*. Fig. 6*b*. Fig. 6*c*.

Fig. 6. *b*, første Tværvæg, *c* anden do. Se forøvrigt Teksten. $^{400}/_{1}$.

Forøvrigt forløber Kimens videre Udvikling paa lignende Maade som hos de øvrige Polygonaceer, saaledes som nærmere beskrevet af Souèges og Lonay, til hvis Arbejder jeg derfor blot skal henvise.

Materialet til denne Notits er samlet af mig selv paa Grønlands Vestkyst (ved ca. 65° n. Br.) og Færøerne i Sommeren 1925, fixeret i Carnoy's Vædske og farvet med Jern-Hæmatoxylin efter Heidenhain.

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IV.

THE BIRDS OF ANGMAGSALIK

BY

O. HELMS

BASED UPON THE COLLECTIONS AND NOTES OF
JOHAN PETERSEN

WITH 1 MAP

1926

The Colony of Angmagsalik.

A perusal of the reports of the exploration of the East Coast of Greenland from the time of Scoresby to the present day is like the gradual unfolding of a series of fairy-tales, and no one with a little geographical taste will have cause to repent having become acquainted with what has been accomplished, what has been suffered, and what has been discovered on these journeys. The whole of the coast has now been travelled, the last, most northern stretch by the Denmark Expedition, the last piece but one by Amdrup's bold journey. The expeditions have returned home, and at home the results have been recorded in quiet and comfort. Upon the bleak east coast has remained the Danish colony Angmagsalik, founded by the Government of Denmark and for a number of years after its foundation ruled by the colony superintendant Johan Petersen.

Merely one aspect of Johan Petersen's activities will be referred to here: his work in the service of ornithology. It is true that the birds form only a small part of nature as a whole, and on all East Greenland expeditions birds have been collected and observed. But hardly of any spot in the whole of the inhabited world can it be said as of this, that one man for so many years has lived in the only populated place on a coast several hundred miles[1] long and made his notes on the bird-

[1] Here as elsewhere in this paper geographical miles are meant.

life — sparse, it is true — that is found here, and has also collected and prepared birds. It is worthy of mention, too, that Johan Petersen's work to this end has exclusively been for the purpose of study and without any pecuniary advantage whatever.

Johan Petersen has been connected with Angmagsalik as long as the place has been known to Europeans. As quite a youth he took part in 1883—85 in G. Holm's Konebaad (Greenland skin-boat) expedition, the objective of which was actually the Angmagsalik district; its wintering place was near to where the colony was later founded. Afterwards he spent a year on the southern part of the east coast, where attempts were made to establish a trading station at Itivdlek, in lat. 60° N. When the colony of Angmagsalik in 1894 was founded on its present spot, he became its superintendant, a post which he held for twenty-one years, — from 1894 till 1915. In all that time he was twice home in Denmark where he finally returned in 1915. From August 1923 till October 1924 he again spent a year up there.

During the whole of his sojourn in Angmagsalik Petersen made observations of birds and, in the ordinary diary he kept, made notes as to their occurrence, breeding, time of migration, and so on. All these ornithological observations he sent home to the author of this work, and they form a valuable material which, after use, will be placed in the Zoological Museum. In addition he has all the time collected bird-skins, both those of the more common species and those of the more rare and casual guests, prepared the skins and sent them home as gifts to the Zoological Museum, which thus owns a collection of really unique character.

Portions of the material which Petersen has in the course of years sent home — notes and bird-skins — have been prepared and published at various times, here and there; a list of what has been published earlier will be given further on. Of the last material to come home, from 1909 till 1915 and from 1923 till 1924, nothing has been made public beyond a brief report of a few rare species. Through Petersen's labours there is now so voluminous a material that one can obtain a clear idea of the bird life at Angmagsalik as a whole and of its changes with the seasons. We know most of what there is to know about the scarce stationary birds and their conditions; we know the arrival and departure of the migratory birds, and we have information about the surprisingly numerous, quite casual, roving guests which have put in an appearance at Angmagsalik. There is such an abundance of material that we not only learn what the bird-life has been in some years, but realise what may be called the normal occurrence of the birds and the many departures which are due to special climatic conditions in one or another year. The other animal life at Angmagsalik, both lower and higher, as well as the vegetation, have been thoroughly investigated and described

in a stately number of volumes of Meddelelser om Grønland. A complete survey of bird-life will form a natural connection to the other works, and I have therefore attempted, with the approval of Johan Petersen, to give a description of the bird-life at Angmagsalik, drawn up on the basis of his notes.

The east coast of Greenland, from Cape Farewell in lat. $59^3/_4$° N. up to the north point in lat. $83^1/_2$° N. has now been explored, as already stated; it is a stretch of about $23^3/_4$ parallels of latitude, 356 geographical miles, about as far as from Copenhagen to Tripoli. For years expeditions have stayed — voluntarily or of necessity — on the east coast, but only that one little spot at Angmagsalik has been constantly populated. The character of this long stretch of coast is of course not the same everywhere. The most southern portion has conditions very nearly the same as the southern part of the west coast, with deep fjords. Then comes a long stretch, from about 63° to 70°, where the direction is to the north-east, where the coast is only slightly indented and the protecting belt of islands is lacking, whilst the inland ice goes out close to the sea and the open coast-land often consists of steep and wild rock-work. Animal-life and vegetation are scarce here; only on one spot on this coast, in lat. 66° N., are there deep fjords, a protecting belt of islands and a richer vegetation. It is here that the Angmagsalik district lies like an oasis, as the botanist Kruuse calls it. Between 70° and 77° N. the country again assumes quite another character; there are deep fjords like Scoresby Sound and Frantz Joseph's Fjord, many islands along the coast, and, inside these, great flat stretches of rather low, not ice-covered foreshore, with the most abundant animal and vegetable life on the whole of the coast. North of this stretch lies the most of that part of East Greenland travelled by the Denmark Expedition, where the country is again bleak and wild, with only very little animal life and vegetation.

This northern part of the coast, from 70° northwards, is, however, only mentioned here incidentally; if one would understand the bird-life af Angmagsalik, it must constantly be borne in mind that much farther north there are large numbers of birds, which do not breed at Angmagsalik but regularly or more casually visit that district.

If we keep to the most southern part of the east coast, south of Scoresby Sound, really only the part farthest south can be regarded as in any way having luxuriant vegetation. Holm was in to the far end of Kangerdlugsuatsiak (Lindenow's Fjord), in lat. 60° N., and writes of luxuriant places with angelica as high as a man, willow-herbs two feet high, impenetrable willow-coppices, and large stretches covered with bacciferous plants. The conditions change, however, only a little farther north; there are still fairly deep fjords, and mention is often made of

green grass and heather-grown areas; but just this eagerness to mention them shows better than anything else how sparse the vegetation is on the whole. In contrast to this there are frequent reports of glaciers which extend right out to the coast, of the wild, jagged, shattered mountains, of the steep, barren coast-land, the field-ice which settles along the coast, the calf-ice that fills the fjords, and the new winter ice which already appears in August. How little attractive the conditions can be, even at the time that is otherwise looked upon as summer, may be imagined when one reads Garde's description of his journey from Tingmiarmiut, in lat. $62^3/_4°$ N. back to Nanortalik on the west coast, a journey that was made in August-September.

Between $65^1/_2°$ and $66^1/_2°$ N. lies the district of Angmagsalik itself. From there almost to Scoresby Sound, about lat. 70° N. the coast runs in a north-east direction. It is a barren, only slightly indented stretch, with no protecting belt of islands, with steep, wild mountains out towards the sea, with the glaciers of the inland ice extending right down to the shore, in many places with only sparse vegetation. A few quotations will perhaps best show what the conditions are. Knud Poulsen, who took part in Amdrup's expedition in 1899, has travelled the coast in the best part of the summer, the month of July, and gives the following description: "North of Angmagsalik district is a short stretch [with the islands Jærnø (Iron Island), Stenø (Stone Island) and Depotø (Depôt Island)], where the country is only slightly indented and animal life on the whole scanty. To the north of this area is a deeply indented coast, with deep fjords and a number of islands (with Ingolfs Mountain and the fjord Kangerdlugsuatsiak), on the whole reminiscent of the Angmagsalik area; animal life is scarcely so abundant as there, but resembles it greatly; from here northwards, almost to 67°, is a wild coast-land with high, jagged mountains which fall vertically down into the sea, in some places with tremendous glaciers out to the sea. Still, here and there were green spots on the cliff walls, and at any rate the points were bare of snow, even if there were yet (at the end of July) enormous snowdrifts on the mountains. But on the stretch from 67° to the end of the journey in 67° 21′ N. the appearance of the country was wintry in every respect. Almost everywhere the inland ice reached down to the coast, in many places the snow lay a yard deep right down on the points; the islands were often covered with snow, and the winter ice lay unbroken out in the fjords; a small green spot was a rarity."

And if one reads the description Amdrup wrote of the trip he made in the summer from July 22nd to August 18th, 1900, from Cape Dalton near Scoresby Sound to the most northerly point which Poulsen mentions, the impression does not become brighter. Barren, desolate and steep mountainous country, with glaciers down to the sea, gulfs and small

fjords on which the winter ice still lay, unbroken in places, only here and there a spot bare of snow on land where there was sparse vegetation, which, however, was mostly scattered and stunted. Little is said of bird-life, too; a few Common Eiders, sometimes in small flocks, some Black Guillemots and some Gulls. A few bird-cliffs were found, where at the most fifty to a hundred pairs of Gulls and some Black Guillemots were breeding. This is all that the report contained about birds. Neither was the climate mild; the temperature was taken early in the morning and in the afternoon, the average being 1.7°.

A perusal of Kruuse's descriptions in Meddelelser om Grønland, Volume 49, gives the impression that vegetation is rather more luxuriant along this coast than would appear from Amdrup's report; this is owing to the fact that Kruuse includes all the plants he found, and of course a certain number are to be found even in the most desolate areas. As to vegetation, says Kruuse, from Angmagsalik to Scoresby Sound there are two flora areas: one south, with inland flora, and one to the north, with an equally marked coast flora. The boundary between these two areas lies naturally at Cape Wandel in lat. 66° 18′ N. Otherwise the difference in the vegetation may be seen from the fact that in the Angmagsalik district in every place examined (the outer islands excluded) there were found on the average 72 species, in the northern, coast district only 24 species. The most luxuriant locality in Angmagsalik bore 142 species, the poorest 21, whilst the best coast locality in the north only had 48 species, and the poorest 4.

The Angmagsalik District.

On the east coast, which as a whole is desolate and bleak, lies, rather more favoured by natural conditions, the district of Angmagsalik, roughly stretching from lat. $65^1/_2$° N. to $66^1/_2$° N., from long. 35° W. to 38° W.

The natural conditions must be briefly mentioned in order to show what it is that makes this district a favourable place for birds. The coast line itself at Angmagsalik runs almost east-west instead of north-south as it does just south of the district, and southwest—northeast on the north of it. The limit on the west is the fifteen miles deep Sermilik Fjord, which runs almost north—south, and at its innermost point is adjacent to the inland ice, whereas the boundary on the east is Sermiligak. Between these two fjords several others run far in; one of them reaches as far as the Sermilik Fjord and thus cuts Angmagsalik Island off from the mainland; the water between this island and the islands lying outside is called Angmagsalik Fjord; it stretches 9 miles inland.

The whole of this district is for the most part a wild, mountainous country, where even on the small islands mountain tops rise everywhere, the highest more than 2000 metres. Low land, less than 200 metres high, occurs only very infrequently, while lakes and fens are scarce. But up in the fjords, in more favourable places, vegetation is fairly luxuriant and, even if it can nowhere be compared with the vegetation in south-west Greenland, there are great stretches, covered with plants, forming the usual meadows, herbaceous plots, heather heaths and thickets.

Few districts in all Greenland are probably so well explored in a botanical sense as the Angmagsalik district. On all the expeditions which have been to Angmagsalik, right from Nathorst, who visited the area in 1883, plants have been collected and the vegetation described. The most exhaustive description is by Kruuse who, in 1898—99, accompanied Amdrup on the boat trip between 65° 35′ and 67° 20′, and later sojourned a whole year in the Angmagsalik district from September, 1901 to September, 1902; he has made botanical investigations all over the district and drawn botanical maps of several localities. He proved that in every direction there was a fairly luxuriant vegetation, particularly deep into the fjords. In many places there are thickets of willow, here and there very extensive, seldom more than a metre high, as well as thickets of dwarf-birch and juniper. In favourable places there are large stretches with what Warming has called herbaceous plots, frequently with up to fifty kinds in one locality. There are extensive grass areas and grass fields, heather heaths mostly formed of black crowberry and marsh whortleberry, which however only bear an abundance of ripe fruit in very few places. There are one or two fens and a number of small lakes with rich vegetation along the edges. This comparative luxuriance of plants is further shown in the fact that in the whole district a total of 184 kinds of flowering plants have been found.

Kruuse describes one locality as follows: "Close to the north of our camping ground (on the east side of the fjord) at a height of 30 to 70 metres above the sea, the foot of the mountain is covered by the largest willow thicket in the district. The bushes (*Salix glauca*) attain a height of more than one metre above the ground, and the stems, the lower part of which lie along the ground, are at times more than three metres long and three centimetres in diameter at the base. Each tree has three to six stems which spring from a very old, tuberiform, often very decomposed trunk below the ground. The stems rarely attain more than 40 to 60 yearly rings, while the age of the underground portion cannot be determined. Through the thicket the ramifications of a clear, quiet mountain beck worm their way and supply the fresh soil with abundant moisture."

"Even at our first visit (June 21st) the snow had long been com-

pletely melted away from the thicket and the bushes were budding, although blossoming had not commenced. The willow thicket was obviously dependent upon the rich supply of water; for outside its domain there was, as over most of the mountain foot, a thick heather heath on which the willow was rare and, with its gnarled offshoots, only reached 15 to 20 cm. above the ground. In the thicket bloom the wall-cress (*Arabis alpina*); club-moss (*Lycopodium annotinum*) and a sort of fern (*Aspidium dryopteris*) are fresh, green and fully developed. The other wood-land plants have not flowered yet. But everything smells so fresh, with that homely smell of the soil, and is so green, that one imagines a much more southerly latitude. In addition, insect life is abundant. Large black long-legged spiders run about on the soil, small grey butterflies flit about in company with bees, while there are swarms of flies and midges — the latter rather more than is comfortable, although they have not yet become the plague they were at our second visit to the place."

The vegetation in a locality is all-important to the insect life, and the possibility of small birds being able to subsist in a place essentially depends upon this factor. East Greenland is not particularly favourably situated as regards vegetation and, as a consequence, has no great abundance of insects either; in this respect it cannot be compared with West Greenland. Of beetles (*Coleoptera*) there are 9 species, of bees (*Hymenoptera*) 18, of midges (*Diptera*) 45 and of butterflies (*Lepidoptera*) 18.

For many of the water birds it is essential that the waters contain fish, and, even if fish do not abound, there are sufficient of a few kinds to provide food for the sea-birds. In all the streams and inland lakes there are salmon trout, and in the lakes sticklebacks too. In the sea there are two kinds of cod in large numbers and, what is of most importance, shoals of capelans (angmagsæt), from which the whole district has its name. The bigger and more rare fish are scarcely of any importance in this respect.

The reason for going fairly deeply into the exterior conditions of the Angmagsalik district, particularly its vegetation, is to give an idea of the conditions which offer to induce the birds to sojourn and breed here. It will be seen that there is so much variation in the localities that there must be an opportunity for a number of birds to breed. The larger and smaller lakes suit the Divers, while out in the fjords there are comparatively low islands, good breeding places for Gulls and Terns.

The low thicket which covers such large stretches provides food for the flocks of Ptarmigans which make their way down here in the winter, their principal winter food being leaf-buds. Most of the diving birds breed further to the north; but in winter the conditions at Angmagsalik are frequently quite good for them, the strong current in all the numerous narrow fjords and gulfs often, even during the hardest frost, keeping the "current-runs" open for long periods; the birds can keep to these, while the sea yields plenty of food for most of them.

The climate at Angmagsalik varies so much that it is difficult to describe it in few words. The mean temperature for the whole year is —2° C.; for the various months:—

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
—8.5	—10.4	—8.1	—4.5	0.8	4.9	6.6	5.9	3.3	—1.3	—5.4	—7.2

The highest recorded temperature is 20.5 and 25.3, the lowest —30.7; frost may appear in any month, as on the other hand the temperature in any month may be above 0°, a circumstance which is due to the Föhn winds, which bring abrupt rises in the temperature with them. In all the months except June, July and August the frosty days exceed the number of days without frost. The rainfall is on the average 907 mm., and varies greatly; there is rain on half the number of days in the year. Most of it falls in September and October, when the average is 108 and 154 mm. Fog is rare in winter, more frequent in spring and summer; in the period May—August there is fog about every fourth day. The force of the wind is on the average for the whole year less than 3 m. pr. sec.; it blows strongest in the winter half-year, when gales most frequently come from the north and north-east. Föhn winds, with abrupt rises in temperature and rain, make their appearance in all months, mostly from the west and northwest, and at times are exceedingly violent. But at the station itself, where the records are taken, it is much calmer than farther out at the coast; there is a calm at the station on about 50 per cent. of the days of the year, but only on 17 per cent. out at the coast. How varied the weather conditions can be in the different years may be best illustrated by passages from Petersen's letters; on August 12th, 1900, he writes: "The winter (1899—1900) has on the whole been mild, without much storm or rain, and since April and up to the time of writing there has hardly been a day when we have not had a glimpse of the sun."

Quite the opposite state of affairs is evident from a letter dated August 12th, 1901: "A stormy and rough winter, but luckily without much cold... the summer, as regards the weather, has not been much

better than the winter, as except for the past two weeks we have not had much else than rain, fog and wind."

Like the climate as a whole, the snow-fall varies very much. Some winters only a little falls, and then only late in the season; in others the country may be covered with several feet of snow in November, and there may be so much that it is not melted by July 1st. In April the snow begins to melt on the mountain sides, while May is the month when it really melts in earnest. The layer of ice in gulfs and fjords also varies very much; ice certainly begins to form in November—December, but heavy gales break it up again. Not until February or March does a more durable layer form, and sometimes this breaks up as early as in April, although it does sometimes last until May or June. Owing to the shape of the coast, however, with its numerous sounds through which there is a strong current, there are always open places even when the ice-layer lasts a long time; these are the so-called "current-runs" and, of course, they play an important part in the life of the birds.

The field-ice, as the belt of ice-floes and ice-fields, often many miles broad, is called, brought from other districts by the current down along the coast of East Greenland, is fairly regular in its occurrence, although the quantity of ice may vary greatly. Owing to the situation of Angmagsalik on a stretch of the coast which runs almost east-west, and on account of particular current conditions, this district is less besieged by field-ice than the remainder of East Greenland, and here the ice-belt is often comparatively scattered.

From November until the end of May the field-ice most often lies in a belt several miles broad along the coast—densely packed in against the land or further out to sea according to the direction of the wind. In June the ice begins to scatter and disappear, and this is continued in July, August and September; in this latter and the following month, but particularly in October, there is usually an entire absence of field-ice, which however again begins to appear in November; some years it happens, however, that it does not wholly disappear. During the winter the field-ice is occasionally driven on shore and forms one mass with the ice in the fjords and gulfs, but it is seldom that this happens.

The trading station of Angmagsalik must also be said to be favourably situated for the observation of the birds, as it lies on the south side of Angmagsalik Island, just to the west of the narrow mouth of a gulf, Tasiusak (King Oscar's Haven), which stretches almost half a mile inland and is just as broad. Round here the land is fairly low with abundant vegetation, one of the most luxuriant places known on the east coast. At the back of the gulf are three smaller gulfs, into which run streams from some large lakes farther inland and abounding in fish. There are a few small islands in Tasiusak, and on the east side is

a current-run often mentioned by Petersen, Kililtorajivit. The station itself consists only of a few houses, including the dwellings of the trading superintendant and the missionary with their families — for a number of years the only Danes in East Greenland — and storehouses.

Even though most of the observations have been made by Johan Petersen himself, his notes contain constant reference to the help given him by the Greenlanders, who have brought him birds shot here and there in the district. From this point of view it has been exceedingly fortunate that the five or six hundred Greenlanders who live in the district have their dwellings so scattered; some live on islands at the mouth of the Sermilik Fjord, others on the large island Cape Dan, out to the open sea, and again others are scattered about the Angmagsalik Fjord. When Holm in 1884 counted the inhabitants he found 371, spread over twelve different settlements; in 1920 the number had increased to 642. It is also of great importance that it is only during the winter that the Greenlanders live in one place, whereas in summer they travel about in the district to places where the best hunting and fishing are to be found.

The Birds at Angmagsalik.[1]

A. Breeding Birds.

In the foregoing an endeavour has been made to show what the natural conditions are at Angmagsalik. The birds have only a short spring and summer, but long enough for them to hatch and feed up their young before the winter arrives. There is variation enough in the landscape and in the vegetation for a number of different species to breed; what is mostly lacking is stretches of fens and marshes; there is no place of which one can, as Bay writes of the conditions at Scoresby Sound, say that the district is actually very similar to Denmark. But, despite the somewhat favourable conditions, there are only few species of breeding birds, and of each species only few individuals. West Greenland has not many breeding birds either, but some of them appear in great numbers, in thousands, whereas at Angmagsalik one can barely speak of hundreds. There is no great difference from the species which breed in West Greenland; they are the usual circumpolar breeding birds, with a slight mixture of the fauna of Iceland.

Among the Passerine Birds we find those familiar to most of Green-

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[1] The essay was mainly finished in 1920, but circumstances have prohibited its publication before now, 1926. Reference is not made to the newest investigations of birds in East Greenland which are also for a greater part still awaiting publication.

land, the most frequent and typical being the Snow Bunting, the most numerous of the polar perching birds. It is common at Angmagsalik, breeds there in probably the same number as in most places on the west coast. It easily finds what it requires, a rocky cleft for its nest, seeds of various plants for food, and in summer larvae to feed the young, and of all these there is sufficient. It seems to thrive well here, too, makes its appearance at least as early as in similar places on the west coast and stays just as long into the autumn.

Its relative, the pretty Lapland Bunting, the only one of all the birds of the North that has a really metallic clang in its song, also breeds in the district, but in smaller numbers; it is the bird of the plains and marshes, must have a tussock on marshy ground to built its nest by, likes a wet bottom best as does its relative the Reed Bunting in Denmark, and at its breeding place prefers to have a few bushes, or, for want of these, a clump of stones on which it can sit and look round. It has made its way to the Angmagsalik district in no small numbers, the only place on the east coast where it has been found breeding. Of the Perching birds proper there remains still one, the Greenland Redpoll; it is the little, grey race frequently met with all over South Greenland, which in North Greenland is replaced by the bigger, whiter form. It is rather more particular with regard to nesting place than the two just mentioned, requiring a little bush to build in — of the most modest type, to be sure, and up the cliff if necessary; it is the only bird breeding in Greenland that builds in a bush. Like the other small birds it comes in April and leaves in September; before departure it flocks, comes in close to the houses and is on the whole one of the species which help most to give life to the landscape. The last of the common small breeding birds is the Greenland Wheatear, the arctic form of the Wheatear, which in the Angmagsalik district, as in most parts of East and West Greenland, is met with everywhere, both out by the coast and in along the fjords, often high up the mountains; it sits on the stones, its dark tail with the light spot at the base constantly in motion, easily recognisable from all other small birds; it is a fairly hardy bird and not rarely braves the bleak October weather. With these four common Greenland species is exhausted the small birds which usually breed at Angmagsalik, but there are still two which at any rate in certain years breed up there. These are the White Wagtail and the Meadow Pipit. It is true of them both that on Iceland they are common breeding birds, that they have not been met with as breeding in any other part of Greenland, and that they scarcely breed every year at Angmagsalik. The truth is probably this, that some birds of both species, during the spring migration to Iceland, get out of their course, are driven in to Angmagsalik, and there find conditions which make it not impossible for them to breed. And

probably the common law for the whole of the bird world also applies, that birds return to the place where they were hatched, so that some individuals the next year — if one may put it that way — find the way there themselves. Of the two species the Meadow Pipit breeds most commonly; it keeps to the immediate vicinity of the Station, where its song is also heard. The White Wagtail is not seen every year and is only sparse in number. Both species are doubtless northern forms, but not circumpolar like those in the foregoing; they belong principally to more southerly areas, a great part of Europe for instance.

This completes the number of small Perching birds breeding at Angmagsalik. To this group, although formed in a particular manner, belongs the giant among Perching birds: the Raven, which is common at Angmagsalik as elsewhere in East and West Greenland. It nests on shelves in the cliffs, collects in flocks in the autumn, stays during the winter, and only the most severe winter now and then succeeds in driving it away. In the winter-time it is probably the winged creature that is most frequently seen and breaks the monotony of the landscape. Of the land birds, besides those already named, the Ptarmigan is a common breeding bird, but in the breeding time it is not seen much; at this period it keeps to the mountains, often very high up, is mostly met in flocks in spring and autumn, in smaller numbers and irregularly in winter.

Of land birds which breed there thus only remain the scarce Waders; at Angmagsalik there is a lack of the extensive lowlands which are found farther north as described by Kolthoff from the Mackenzie Gulf, Bay from Scoresby Sound, Manniche from Denmark's Haven. The species are few and the individuals only small in number; a common breeder is the Ringed Plover, well-known in Denmark and frequently seen in West Greenland, very often met with in summer on meadow stretches in the Angmagsalik district and appearing in small flocks after breeding time. The second species is the Purple Sandpiper, which spring and autumn appears in small flocks and breeds in small numbers; as a rule it does not winter at Angmagsalik. As the third commonly breeding wader there is the Rednecked Phalarope, which breeds sparsely by the small lakes here and there in the district; in West Greenland it is very common, whereas on the east coast, apart from Angmagsalik, it has only been seen at Scoresby Sound. It is possible that one or two Turnstones, Golden Plovers and Whimbrels also breed, as all three are sometimes seen at breeding time; that they do breed there is not, however, definitely proved. Of land birds there only remain as breeders the Peregrine Falcon and the Greenland Falcon; that the first-named breeds here must certainly be regarded as a pure exception, and Petersen only mentions two nesting places for it. The Greenland Falcon, which is mostly of the Greenland race *candicans*, also appears very rarely

in the breeding time; it is different in the autumn and winter, for then at times large numbers gather, presumably birds from more northerly districts in East Greenland where, as a matter of fact, it commonly breeds, and during some winters many of them are seen at Angmagsalik.

The Angmagsalik district does not seem to offer much attraction as a breeding place for the water-birds either. Ducks are only met with occasionally and scattered; they prefer plain-land with lakes and streams. The Mallard breeds here and there, in the autumn it stays round the ice-holes and current-runs, as long as there is open water; on some of the small islands the little Long-tailed Duck breeds, and towards the winter and spring time it is seen in flocks. Quite exceptionally, hardly every year, the handsome Harlequin Duck, whose appearance as a breeding bird in East Greenland is not otherwise known, occasionally breeds here; those which breed at Angmagsalik must presumably be looked upon as having come from Iceland, where the species is a common breeding bird. In small colonies, of not more than ten couples, the Common Eider breeds; sometimes in the spring and autumn it is fairly common, but never appears in such numbers as in West Greenland and on the whole it is very irregular in its occurrence. As the last of the breeding ducks must be mentioned the very rare Red-breasted Merganser, which has otherwise only been seen at Scoresby Sound on the east coast, and then only once by Manniche, on the Denmark Expedition.

As everywhere in Greenland, the Gulls are among the birds which give character to the landscape, but their number as breeding birds is not great in comparison with the crowds which are found in West Greenland. The giant of all gulls, the Great Black-backed Gull, breeds occasionally in the Angmagsalik district, the most northerly place in East Greenland where it has ever been seen. The Glaucous Gull and the Iceland Gull breed in not inconsiderable numbers, some on bird-cliffs and others on small islands, which the birds manure and create a luxuriant vegetation. On these islands the Arctic Tern also breeds; in several places it is met with in large colonies. The Kittiwake, which breeds in such enormous crowds in West Greenland, is on the other hand a very rare bird at Angmagsalik.

Of Auks, which in West Greenland form such a large part of the bird-life, but which principally breed in the more northerly districts, there is at Angmagsalik only the Black Guillemot, which here, as in West Greenland, breeds scattered among the clefts in the rocks and is one of the commonest breeding birds; it breeds on the east coast as far north as it has been explored.

Of breeding birds there still remain the two Divers, the Great Northern Diver and the Red-throated Diver, which in spring come to the lakes as soon as these are free of ice. They are fairly numerous

and are about the only species of which Petersen remarks that they are just as numerous at Angmagsalik as on the West Coast. The many large and small lakes abounding in fish on Angmagsalik Island itself and here and there in the district offer them suitable breeding places. They usually arrive in May and depart in September. Both species are of the typical circumpolar birds and have been met far to the north in East Greenland, although not in the most northerly districts.

Petersen has occasionally mentioned as breeding birds in the Angmagsalik district the Cormorant and the Little Auk, but we have no definite information of their breeding.

The breeding birds at Angmagsalik may be divided into two groups: those which are migratory birds and regularly leave Greenland under all circumstances, and those which are stationary birds as long as it is possible for them to remain; in other words, those which remain until frost, ice, snow, and the consequent lack of food, compel them to depart.

All the small birds are migratory birds proper; so are also the Peregrine Falcon, the Ringed Plover, the Rednecked Phalarope, the Terns and the two kinds of Divers. Of the other species it is true to a greater or lesser extent that they stay in the district as long as circumstances permit and are only driven away by force of necessity. The consequence is that nothing can be said with certainty as to their abiding in winter; some winters they quite disappear, so that from December to March the country lies desolate and bare of all bird-life; other winters there are many Ptarmigan on the mountains and, following them, the Falcons, whilst on the waters may be seen crowds of Gulls, Ducks and Diving birds. A list of the breeding birds is as follows:

Mallard; Long-tailed Duck; Harlequin Duck; Common Eider; Redbreasted Merganser; Ptarmigan; Great Northern Diver; Red-throated Diver; Ringed Plover; Purple Sandpiper; Red-necked Phalarope; Glaucous Gull; Iceland Gull; Great Black-backed Gull; Kittiwake Gull; Arctic Tern; Black Guillemot; Greenland Falcon; Peregrine Falcon; Raven; Meadow Pipit; White Wagtail; Greenland Wheatear; Greenland Redpoll; Snow Bunting; Lapland Bunting.

Species which possibly breed occasionally are named as the Common Plover, Turnstone, Whimbrel, Cormorant and Little Auk.

The definitely breeding species number 26, which by no means can be called a high figure.

B. Birds Which Regularly Visit Angmagsalik During Migration.

The second group of birds is formed of those which breed further to the north, in Greenland, and which more or less regularly visit Ang-

magsalik, either during their flight to the north or south. As regards some of the species their migration is southwards — no farther than to Angmagsalik, to be exact. Here some of the sea-birds find open water and sufficient food, and only of necessity go to districts further south. Other sea-birds, various species of geese, for instance, are regular migratory birds and leave the country entirely for waters much farther south, presumably in Europe. But there is no doubt that those breeding at Angmagsalik are considerably augmented by birds hatched farther north which move to the south in winter. For instance, the Ptarmigan, which are often met in crowds at Angmagsalik, are certainly to a great extent birds which have come from the north, and the Falcons which follow in their tracks are so numerous that they far exceed the few couples which are found in the Angmagsalik district. As regards the land-birds, only few species arrive on their flight to or from North Greenland. One species which, like the Ptarmigan, is not a migratory bird but a roving bird, and hardly ever leaves the country, is the Snowy Owl, which is not known to breed at Angmagsalik but is commonly met as a breeding bird in North Greenland. In winter, in the months of September to May, it is by no means rare at Angmagsalik. Of other land-birds there are the Hornemann's Redpoll, the rather bigger, lighter relative of the Greenland Redpoll, the northern Greenland form which certainly is not exactly rare in winter; this, too, is merely a bird appearing in the winter. In north-east Greenland some species of wading birds breed and are seen at Angmagsalik during migration, although irregularly and rarely; these are the Grey Phalarope, the Sanderling, the Knot, and the Turnstone. The only one of these at all commonly met with is the Turnstone; the others are more rare, and it is not at all certain that they should not rather be placed to the next group, the casual guests, which on their flight to and from Iceland are occasionally driven to Angmagsalik; the Grey Phalarope, Sanderling, Knot and Dunlin are not common breeding birds on Iceland, the Sanderling and the Knot at any rate only very exceptionally. As regards the latter we know that the flight to the northern breeding places lies over Iceland, where flocks of thousands stay a short time in spring and autumn. Of water-birds the Ivory Gull and the Fulmar have been met a few times, the Long-tailed Skua once. The first two species are sea-birds, which all the year round keep to the coasts where there is open water; the Long-tailed Skua is essentially a migratory bird.

Among the species which regularly and in the greatest numbers are seen on their flight are the geese. No geese breed at Angmagsalik; but further to the north in Greenland are commonly met: the Barnacle Goose, the Pink-footed Goose, and the Brent Goose. The first two have once been seen at Angmagsalik, whereas the Brent Goose appears in

large numbers, and fairly regularly during migrating time about the middle of May and September.

The King Eider, which also breeds farther north on the east coast, has been seen once or twice. The two kinds of diving birds which in south-west Greenland appear in enormous numbers in winter, the Brünnich's Guillemot and the Little Auk, are also to be found in winter at Angmagsalik. The Guillemot has been met breeding in fairly large numbers on the north-east coast of Greenland. The Little Auk has been seen there in numbers, for instance by Bay in Scoresby Sound; it has not been seen breeding, it is true, but there is hardly any doubt that it does. The two species scarcely leave the coast of Greenland to go further south, or rather, they only allow themselves to be driven away from the coast when the ice forms a barrier, and then they keep to the open sea among the field-ice.

The foregoing has shown that at Angmagsalik in winter there regularly appear larger or smaller numbers of the species which breed farther north, but which are not migratory birds in the sense that they leave the coasts of Greenland. As regards those species which are real migratory birds and breed in the northern part of the east coast, it is apparent that for most of them their flight does not regularly take its course over the Angmagsalik district. If this were the case, large numbers must be met with occasionally; but those which have been seen have almost in every case only been single individuals. A glance at the map will show, in fact, that the birds which have wintered on the coasts of Europe and are on their way to north-east Greenland, might be expected to travel the course over Scotland, Iceland or over West Norway, the Faroe Islands, Iceland, and from there hit the coast of Greenland at about 70°, in the area round Scoresby Sound.

The only species which apparently to a greater extent directs its migratory course over the Angmagsalik district is the Brent Goose, a bird which in north-east Greenland is only rarely met as a breeding bird, even although a number of flocks were seen on the Denmark Expedition. There is something strange in the fact that just this species appears at Angmagsalik at migration time in such large numbers, and I believe that the explanation is that it is certainly migrating, not northwards, but on the contrary across the inland ice to the West Coast; the inland ice, which at this point is hardly 60 miles broad, certainly cannot be any obstacle to a bird like the Brent Goose. That this must be so is supported by the observation made by Johan Petersen of the direction of the flight of the Brent Goose, which in the spring has been from east to west, and in the autumn in the contrary direction.

The species which belong to this group are:

King Eider; Brent Goose; Barnacle Goose; Pink-footed Goose; Turnstone; Dunlin; Sanderling; Grey Phalarope; Knot; Long-tailed Skua; Ivory Gull; Fulmar Petrel; Little Auk; Brünnich's Guillemot; Snowy Owl; Hornemann's Redpoll.

C. Casual Guests.

To the groups already dealt with belonged birds which breed in East Greenland. But apart from these there is a third, very large, and interesting group of birds, those which do not breed at Angmagsalik and do not arrive regularly on migration, are not found at all in East Greenland, but only quite casually come roving along the coast, sometimes from West Greenland, more often from Europe. These are birds which during their flight are driven out of their course and in to the coast at the Angmagsalik district, usually to perish very quickly. That during migration time there are large numbers of birds in the North Atlantic is well known; some of them are on their way up along the west coast of Norway to its most northerly part; others are going to the Faroe Islands, and many to Iceland. Storm, gales, fog, drive them out of their course; many of them no doubt perish in the sea, others succeed in getting to land where they can. A number land on the Faroes, many on Jan Mayen, as we know from the Austrian Expedition there in 1882—83. Some arrive in Iceland, where however — strangely enough, by the way — not so many are met, especially when one compares them with those seen in the course of a short time in the little area round Angmagsalik.

It is doubtless difficult to believe that particularly many migratory birds, driven off their course, should come just to the Angmagsalik district. To judge from the geographical situation one might expect at least just as many further north, for instance at Scoresby Sound. The various expeditions farther north have only met few such species, and the reason is no doubt this, that in the course of a short time only few such birds are met at all, and, in the period the expeditions usually last, not many can be expected. In the Angmagsalik district a number of these species fall by the Colony itself, but most are brought in by the Greenlanders who live scattered about the district; in this respect it is naturally of the greatest importance that a Greenland population, knowing the interest of the trading superintendant in birds, is spread over such a large stretch of country. The list of the species which have been met with as casual guests is as follows:—

Teal; Wigeon; Pintail; Whooper Swan; Common Pochard; Barrow's Golden Eye; White-fronted Goose; Slavonian Grebe; Holböll's Grebe; Land-Rail; Water-Rail; Coot; Lapwing; Golden Plover; Whimbrel;

Common Curlew; Redshank; Common Snipe; Woodcock; Puffin; Cormorant; Merlin; White-tailed Eagle; Long-eared Owl; Rook; Hooded Crow; Martin; Swallow; Starling; Redwing.

A glance at this list will soon show that, with one or two exceptions, all these birds are European-Asiatic species, and that the connection with the North-European fauna is very close through these species. Among them all there is only one exclusively American species, Holböll's Grebe, the great North American race of the common European Red-necked Grebe. All the other species might come from Europe, although this does not say that some of them are not to be found in North America too. On Iceland all the species have been met, with exception of the Land-Rail and the Woodcock, and of the others there are only the Lapwing, Common Curlew, Long-eared Owl, Rook, Crow and Starling that are not definitely known as breeding on Iceland; most of them visit that island often enough during migration.

A number of the species which come to Angmagsalik may doubtless be regarded as certain to perish in that bleak climate, which is so little like what they usually require. The Redwing, the Swallow, the Rook, the Woodcock and the Land-Rail will hardly be able to feed themselves for long, and as matter of fact the reports as to many of them show that they were found dead or dying. Many other species, however, would certainly be able to settle down comfortably, the various ducks and the powerful wading birds, for instance such as the Golden Plover and the Whimbrel. It is hardly impossible that the Harlequin Ducks which once or twice have been found breeding have casually come over from Iceland, nor that the Golden Plover and the Whimbrel do breed occasionally; that even smaller and less powerful birds can settle down and breed is seen from the fact that the White Wagtail and the Meadow Pipit — both so common on Iceland — are now and then found breeding at Angmagsalik.

TEAL (*Anas crecca crecca* L.).

Krikand.

The Teal is one of the casual guests at Angmagsalik, where it appears in spring or autumn, apparently on migration to or from Iceland, where for the most part it is a migratory bird; sometimes it appears in small flocks. Petersen gives the following details of its appearance: At the end of September, 1897, he shot two of a flock of six; they were on a small lake close to the houses of the colony. On September 25th,

1899, he received one from a Greenlander who had shot it the same day at Cape Dan, one of a flock of six. May 15th, 1909 he secured an old male from the Inigsalik district which had been shot a few days before; and finally, one was shot in the harbour at the colony on October 20th, 1914.

The Teal has often been met with on the west coast of Greenland, but those secured there no doubt belong to the American race, *Anas crecca carolinensis* Gm. It is only the old males in nuptial dress of the two races that can be definitely distinguished, and the two skins in this dress that the Museum has from the west coast belong to the race *carolinensis*. The Teal breeds commonly in northern Europe and Asia, and in Iceland is a very common breeding bird.

In all three skins have been sent home:—

1) Young male in first dress, September, 1897. Wing 175 mm., Tail 60 mm., Tarsus 30 mm.
2) Male, in nuptial dress, May, 1909.
3) Young bird, October, 1914.

The skin sent home of the old male is of the typical form, so are also as far as can be judged the skins of the younger birds.

WIGEON (*Anas penelope* L.).

Pibeand, Brunnakke.

Like the Teal, the Wigeon is a casual guest in East Greenland, mentioned as having been shot six times in all in the period from September 25th to October 31st — i. e. during the migration time.

The Wigeon is otherwise unknown on the east coast, and has appeared some times on the west coast. It breeds in North Europe and North Asia and is a common breeding bird on Iceland. In the northern parts of America there lives a closely related species *Anas americana* Gm.; often only regarded as a race. Only the old males in nuptial dress of the two forms can be distinguished with certainty, so that there is always a doubt about young birds as to whether they belong to the one or the other species; but presumably the species met with in East Greenland is of the European form.

The following report is given on its appearance: Shot at the end of September, 1897, at Angmagsalik in a flock with teal; October 16th, 1902, same place, about October 10th, 1905, at Cape Dan; September 25th, 1908, on one of the lakes near the colony, and October 21st, 1914, in the colony harbour.

The skin of the one shot in 1897 was sent home; it was that of a young male — Wing 240 mm., Tail 73 mm., Tarsus 36 mm.

PINTAIL (*Anas acuta acuta* L.).

Spidsand.

Only once has the species been met with at Angmagsalik, Petersen having obtained a female which had been shot on May 14th, 1913. It stood by a current opening with another, much smaller duck; was very emaciated. The skin was sent home. The pintail breeds commonly in the northern parts of America, Europe and Asia, is numerous on Iceland, from which the specimen shot no doubt came.

MALLARD (*Anas platyryncha conboscas* C. L. Brehm).

Graaand, Stokand. E. Gr.: **Pikivanok** = He who flies straight up.

The Mallard is not uncommon as a breeding bird at Angmagsalik, even if only few pairs breed there; as a rule it seems to breed fairly late, Petersen having secured 8 newly laid eggs on June 25th, 1899, and also on July 18th, 1901; on September 27th, 1899, he obtained 3 barely fully-fledged young and on September 20th, 1904, an almost fully grown duckling.

Otherwise it is met with at all times of the year, is apparently a stationary bird, and has been shot in all the winter months. In the bleak season it keeps to the current openings which do not freeze over, and there some of them are often shot. Petersen obtained 4 on January 3rd, 1905, shot the day before at Sarfak out of a large flock; on January 17th, 1906, two, shot in Sarfakajik, and February 28th, 1914, no less than 6, shot at the current openings at Ikerasarsuak and Kasigiarmiut; at this latter current opening especially it is said that there were large numbers. On November 19th, 1924, he obtained one shot at a small current opening at the east end of Tasiusak, two having been shot.

The skin of a male in nuptial dress, shot June 3rd, 1899, was sent to the Museum.

The typical form of Mallard, *Anas boscas boscas*, is spread over the greater part of Europe and Asia; the one met with in Greenland is one that is characterised by its considerable size and different variations in colour; the only skin sent home from Angmagsalik was clearly one of this species. On the west coast the Mallard is a common breeding bird; on the east coast it has not with certainty been observed farther north than at Angmagsalik.

WHOOPER SWAN (*Cygnus cygnus islandicus* Brehm).

Sangsvane. E. Gr.: Kugsuk.

The Whooper Swan, which is a common breeding bird in the most northerly parts of Europe and Asia, with Iceland as the nearest breeding

place, is a casual guest in the Angmagsalik district, but sometimes is seen in small flocks. In West Greenland it is often met with, and seems to have bred there; it might be thought that the species found there was the North-American *C. buccinator*, but the skins received so far have proved to be of the European race.

Petersen reports as follows on its appearance at Angmagsalik: About April 20th, 1900, the inhabitants of Nunakitit near Cape Dan are said to have seen a swan resting on the water and flying, but it was too shy for them to get near enough to shoot. At the same place on May 4th, 1901, a Greenlander saw a flock of 3, and July 19th the same year Petersen received from Sarfak on the Sermilikfjord 2 skins of swans shot there, presumably about the beginning of June. It is permissable to presume that these are the same birds that were seen there in May. Finally, on July 6th, 1903, Petersen saw 7 swans at the Sermilikfjord, flying low to the west, and reports further as to its appearance in the subsequent years:—

May 20th, 1924. My assistant Högh has today seen a swan over by Sarfakajik; also reported seen some time ago at Sermilik. Probably the same bird seen in different places. Also reported seen at Kernertuarsuit. June 19th, 1925. Received today from Angmagsætplads (Kingak) a swan, shot there a few days before. As it was badly shot about, did not send it home.

Two skins were sent home of birds in full plumage, shot in July, 1901. Crania and bills were packed in with them, and showed that the birds belonged to the race *islandicus*.

SCAUP (*Fuligula marila marila* L.).

Bjærgand.

Only once has this bird been met with at Angmagsalik, Petersen having received an old male in nuptial dress, shot by a Greenlander on the edge of the beach close to the colony on May 12th, 1909.

On the east coast the Scaup has only been seen once apart from that at Angmagsalik, Manniche having shot one on the Denmark Expedition close to Danmarks Havn. On the west coast it has been met with a few times, as well as the only very slightly different American race *F. m. affinis*. It breeds commonly in northern Europe and Asia, and on Iceland is a very common breeding bird.

The skin of an old male in nuptial dress was sent home.

LONG-TAILED DUCK (*Clangula hyemalis* L.).

Havlit. E. Gr.: **Aĝdlek** (from the voice).

The Long-Tailed Duck breeds here and there on the small lakes at Angmagsalik, but not in large numbers. In the winter and spring months it is frequently seen in flocks on the fjord, although the flocks never seem to be particularly large. In north-east Greenland it is a common breeding bird, leaving there as early as the month of September; some of the flocks seen at Angmagsalik in winter are presumably migratory birds from the north. On the west coast of Greenland the species breeds in large numbers; it is on the whole a common circumpolar bird.

The skin of a young male, shot in October, 1900, was sent home.

HARLEQUIN DUCK (*Histrionicus histrionicus histrionicus* L.).

Strømand. E. Gr.: **Tornaviarsuk** = The little helper-ghost.

It is only very rarely that the Harlequin Duck is met with at Angmagsalik, but it breeds there now and then. On September 12th, 1904, Petersen received from the Greenlanders 4 young birds, taken with the bird-dart; they had been found at a stream in Tasiusak; August 14th, 1905, he received from a native an old female which had been found together with its very small young, and September 6th the same year a young bird, which a native had taken with dart in Tasiusak. It would thus seem that several pairs had bred that year, but this is quite an exception. Until 1904 Petersen had never, with certainty, seen it in the district, and does not mention it at all after 1905. On the east coast the species is otherwise only reported from the south part; but Bay reports that one of the members of Ryder's Expedition saw male and female with young in Scoresby Sound (1891).

The Harlequin Duck is common everywhere in North America, which seems to be its principal breeding place; it is common in a part of West Greenland and on Iceland, so that its occasional appearance at Angmagsalik is not strange. The skin of one of the birds taken on September 12th, 1904, was sent home and it proved to be that of a quite young bird, with beam feathers as yet ungrown; furthermore, the skin of the female caught on August 14th, 1905.

COMMON EIDER (*Somateria mollissima islandica* Brehm)?.

Ederfugl. E. Gr.: **Malersertok** = He who is persecuted.

This must be regarded as a fairly common breeding bird at Angmagsalik, but its numbers are only small compared with the crowds

which formerly bred on the west coast of Greenland. The largest colonies only consist of about 10 pairs, and flocks of 50 are looked upon as large. In the autumn it frequents the district as long as there is open water, but it has not been met with in the period from December to March. Its appearance is otherwise irregular; in 1905 and 1906 it seems to have kept away entirely, but appeared again fairly numerously in the spring of 1907. In 1923 Petersen writes that there are now many more than previously. October 6th he obtained 2, which had been taken with bird-dart at the mouth of the Tasiusak out of a fair-sized flock; November 19th he writes that he receives some almost daily.

Petersen has not sent any skins of the Common Eider home, so that it cannot be said with certainty to which race the East Greenland Common Eider belongs; but in all probability it is the same race that breeds in the south part of the west coast, *S. mollissima islandica* Brehm, and it has also been met with at other places on the east coast. The Common Eider, in several races, breeds in all parts of the arctic and subarctic areas, but it is not one of the birds which are found farthest north.

KING EIDER (*Somateria spectabilis* L.).

Pragtederfugl. E. Gr.: **Kingalik** = He of the nose.

It has only appeared twice in all, Petersen having received an old male on May 25th, 1902, from Amitsuarsik and March 14th, 1903, again an old male, shot at Ikerasak on the Angmagsalik Fjord out of a large flock.

On the west coast of Greenland the species frequently breeds in the northerly districts, migrates to the south in winter. In the northerly parts of the east coast, too, it is a fairly common breeding bird, which migrates in September. On the Denmark Expedition it was found breeding in numbers at Danmarks Havn and seen frequently in lat. 80° N. The species is circumpolar and breeds in all the arctic areas.

ICELAND GOLDEN EYE (*Bucephala islandica* Gm.).

Islandsk Hvinand.

Only once has Petersen met with the species at Angmagsalik, having received the head and neck of an old male on September 23rd, 1913, which had been shot during the summer in the vicinity of the Angmagsætplace (Kingak).

On the east coast the species has not been met with at all before this. In North America it is a common breeding bird and also at one

or two places in West Greenland, presumably. On Iceland it is a common breeding bird.

The remaining parts of the killed bird were sent home.

REDBREASTED MERGANSER (*Mergus serrator serrator* L.).

Toppet Skallesluger. E. Gr.: Nuerniagarnak.

It breeds at Angmagsalik, although scarcely in large numbers. Is not known to have been seen in winter, but arrives in the spring, in June, when there is open water. The breeding time varies, as is also the case in Denmark, generally late. July 29th, 1899, Petersen obtained 3 downy young only a few days old, of which one was sent home; September 7th, 1900, a few half-grown young, and September 1st, 1914, a nest of 9 newly laid eggs.

The species is widely spread as a breeding bird over the northerly parts of both the new and the old world; in West Greenland it breeds fairly frequently, and very often on Iceland. On the East Coast it has only been seen on very rare occasions outside Angmagsalik; reported by Bay as having been seen in Scoresby Sound and was once met with by the Denmark Expedition. E. Lehn Schiöler has indicated the West Greenland Merganser as a separate race, *M. serrator major*, but skins from the East Coast are of the typical form.

PINK-FOOTED GOOSE (*Anser brachyrhyncus* Baill.).

Kortnæbbet Gaas. E. Gr.: Nerdlek.

Only once has the species been observed here, Petersen having received one on June 11th, 1901, which had been shot the day before by a native in the Angmagsalik Fjord. The skin is that of an old bird, a typical *brachyrhynchus*, although rather bigger than skins from Spitzbergen.

Wings 445 mm., Tarsus 72 mm., Bill (Culmen) 47 mm.

The skin is exactly the same as one brought home by Bay from Scoresby Sound, where he found it breeding. Dr. O. le Roi at the A. König Museum in Bonn, who had the skin for examination, declared that it agreed on every point with those brought home from König's Spitzbergen Expedition. The species has its main breeding place at Spitzbergen, and possibly breeds on Frantz Joseph's Land too; otherwise it has only been met with in North-east Greenland, where Nathorst and Kolthoff saw it in numbers at the Mackenzie Bay and Frantz Joseph's Fjord, whilst Bay, as already mentioned, met with it at Scoresby Sound.

Petersen states a few times that he has seen wild geese near the

colony, which have also presumably been of this species; he writes, for instance, on September 25th, 1900, that he saw a goose, which he took to be a wild goose, at any rate it was neither a Brent goose nor a Barnacle goose. September 24th, 1912, he saw large flocks of geese — both Brent geese and Wild geese, flying past the colony, mostly from west to east, and May 5th, 1913, he received from a Greenlander a Wild goose which he had shot from a big flock near the neighbouring houses.

WHITE FRONTED GOOSE (*Anser albifrons gambelli* Hartl.).

Blisgaas. E. Gr.: Nerdlek.

The appearance of this bird at Angmagsalik is casual, but not very rare, it having been met with in all about 20 times. Petersen gives the following instances of his having seen or received it:—

A young bird, shot September 19th, 1896, at Tasiusak; May 20th 1901, Petersen saw a flock in Tasiusak; May 24th same year he received a female from Cape Dan, and May 30th one from the same place; May 20th, 1903, he received one which had been found dead on the edge of the beach at Tasiusak; May 29th, 1907, a native brought one from Cape Dan, shot the same morning; October 14th, 1908, another was shot, and September 22nd, 1913, he received a young bird from the district at Cape Dan; October 1st, 1923, he received from Cape Dan an old and a young bird, and June 4th, 1924, two from Sermilik.

The method by which some of the White Fronted Geese were caught is very peculiar, and indicates a strange timidity in the bird. That which was brought in on May 30th, 1901, was caught by a dog. The goose was so frightened when it saw the dog running towards it that it quite forgot to use its wings. Of the one caught at Cape Dan on September 22nd, 1913, Petersen writes: a girl had caught it with her hands, it having fallen among some little girls who were playing ball; by screaming and throwing the ball into the air they had so scared the goose that it lost its flying powers. Two years before it is said that something of the same sort happened in the colony itself; some boys, by shouting and throwing their caps up at a goose, had made it throw itself to the ground.

The skin of the one shot on September 19th, 1896, was sent home; it was that of a young bird without a trace of white on the forehead. On the chin was a white patch, commencing behind the under part of the bill, 30 mm. long, 8 mm. broad, Wing 370 mm., Tail 105 mm., Tarsus 71 mm. The skin of the one shot on May 20th, 1903, was also sent home:—

Wing 365 mm., Tail 105 mm., Tarsus 70 mm., Bill (Culmen) 45 mm.

The two skins sent home appear to belong to the American race of the White-fronted Goose *A. a. gambelli* Hartl., which varies from the main form by having rather darker colours and more spots on the underside, and by being rather bigger. Besides the coast of North America it is also found breeding in West Greenland, principally from lat. 66 to 69° N. It is otherwise only mentioned once from East Greenland, Finsch having categorised it from some quills brought home.

BRENT GOOSE (*Branta bernicla Hrota* O. F. Müller).

Knortegaas. E. Gr.: **Nerdlek.**

As a breeding bird the Brent Goose is not found at Angmagsalik; but among all the species of geese this is the one that appears in greatest number and with the greatest regularity on the way to and from its breeding place farthest north. The regularity with which it appears spring and autumn, each time within a very short period, at other times of the year quite exceptionally, is remarkable. It usually appears about May 10th, and is then seen occasionally until about May 20th; it appears again in the first half of September, and is often seen until the end of the month; in October a few are sometimes seen. Except in these three months it is not seen, although it has been met with once or twice in June.

Both spring and autumn it is found on the water, walking on land, often about the very houses, and flying over — sometimes in large numbers. Where their direction of flight has been indicated it has, in the spring, been from east to west or north-west; in the autumn the opposite. Both spring and autumn a number of Brent geese are shot, and among the feathered game the species is one of those which play an important part to the Europeans living at Angmagsalik.

As to its appearance in the spring and the autumn there is the following data:—

1896, May 12th. Today a number observed migrating past the station.

1896, May 13th. Large numbers seen today, some flying, some sitting on the ice.

1898, May 11th. A flock sat on the edge of the ice at Tasiusak.

1900, May 12th. Both yesterday and today I have seen large and small flocks flying past the station.

1902, May 11th. Today I heard a flock of geese pass here, but could not see them owing to the thick fog.

1903, May 11th. Today saw a flock of geese flying eastwards.

1905, May 6th. From visitors from Cape Dan I heard that yesterday and the day before a number of geese were seen there; these were apparently Brent geese.

1905, May 14th. Yesterday and the day before the first geese were seen flying past here in large flocks.
1906, May 19th. From here I saw large flocks of geese flying past in a north-westerly direction.
1908, May 12th. A goose is said to have been seen at one of the settlements at Cape Dan.
1909, May 9th. Today large flocks of geese are said to have been seen flying past the mouth of the Tasiusak in a north-westerly direction.
1912, May 6th and 12th. Geese seen, apparently Brent geese, flying in large flocks in a westerly direction at a considerable height over the station.

In the autumn the migration appears as follows:—

1898, Sept. 13th. Today I received from a native a young Brent goose which he had shot at Cape Dan.
1898, Sept. 19th. From a native at Kangarsik I received today 2 old Brent geese which were shot yesterday at Norsit out of a large flock.
1899, Sept. 18th. During the past few days I have from natives received no less than 8 Brent geese, 2 of which were young, the remainder old. All had been shot at Cape Dan island, and there are said to be many at that place.
1900, Sept. 16th. Today I saw a flock of probably about 200.
1900, Sept. 27th. During the past 8 days I have received 6 shot by natives at Cape Dan.
1900, Oct. 7th. Saw 16.
1900, Oct. 16th. Saw a flock of 8 in the harbour; six were later on shot close by.
1901, Sept. 5th. I received from a native 6 which he had shot by the settlement at Cape Dan a day or two before.
1901, Sept. 25th. During the past few days received several from round about, most of them young birds.
1902, Sept. 21st. Today I received one from Kangarsik at Cape Dan.
1902, Sept. 25th. Today I saw no less than 4 flocks fly past.
1904, Sept. 17th. A young bird was shot here today.
1904, Sept. 19th. Today I received no less than 6, shot a few days ago at the settlement at Cape Dan.
1905, Sept. 3rd. Today I received from Cape Dan one shot out of a large flock about two days ago.
1905, Sept. 21st. Have received 6 from Cape Dan during the past few days.
1906, Sept. 2nd. Two were shot out of a large flock in Tasiusak.

1907, Sept. 13th. Today large flocks seen flying past in an easterly direction.

1908, Sept. 24th. During the last ten days I have received 15, some from the Cape Dan district and others from the station itself. Many are to be seen round here just now, even by the houses, and some are shot almost every day, mostly old birds.

1911, Sept. 24th. During September I received about a score from the district round Cape Dan, all young birds.

1912, Sept. 24th. Large flocks of geese seen during the past few days — both Brent geese and others — flying past, mostly from west to east.

1914, Oct. 15th. Hardly any geese shot this autumn.

1923, Oct. 1st. Today received nine from Cape Dan, mostly old birds.

There is something extraordinary in the large numbers in which they pass Angmagsalik and also in the direction of the flight. In the spring, when it is to the north-west or west, the road leads over the nland ice, and it seems to come from the same place in the autumn. One might imagine the possibility that the Brent geese breeding on the north-west coast of Greenland or in Arctic North-America made their way across the inland ice, which would certainly only be a short stretch compared with the distance of more than 400 miles many of them have to travel from their winter quarters in the European waters to the breeding places away up in the north.

The Brent goose does not breed at Angmagsalik, and has only very rarely been met with as a breeding bird farther north in East Greenland, although a number were shot on the Denmark Expedition and flocks were seen; nothing more about the breeding places was, however, elucidated. In West Greenland it breeds in numbers in the most northerly districts from Upernivik and to the north, as also in Arctic North America, and on Frantz Joseph's Land and Spitsbergen; on the whole it is one of the species which have their breeding places farthest north, and is perhaps the most northerly breeding bird.

In "Danmarks Fugle" Schiöler states that the Brent Geese appearing in Greenland, including those sent home from Angmagsalik, are of the North American, light-bellied race, which principally differ from the typical form by the rather lighter colour on the underside, whereas they seem to be about equal in size. The race, which was previously called *B. b. glaucogaster* Brehm, is now called *B. b. Hrota* O. F. Müller.

Two skins have been sent home, one of an old bird shot at the Station in 1900, the other of a young bird shot at the same place on October 15th, 1901.

BARNACLE GOOSE (*Branta leucopsis* Bechst.).

Bramgaas.

Only twice has Petersen had this goose, June 11th, 1901, from a settlement near the station and May 23rd, 1902, from another settlement; the latter was shot out of a flock of 4. The skin of the first was sent home, and proved to be that of a young bird in a state of transition to the dress of the old bird.

In contrast to the Brent goose, the Barnacle goose commonly breeds in north-east Greenland between 70 and 80° N., has been found here breeding by Bay on Ryder's Expedition, by Nathorst at Clavering Island and Scoresby Sound, by Kolthoff at Frantz Joseph's Fjord and by Manniche on the Denmark Expedition. Apart from Greenland, Spitzbergen is the only other known breeding place. It appears often on Iceland during migration, but it is doubtful whether it breeds there.

PTARMIGAN (*Lagopus mutus groenlandicus* Schiöler).

Fjældrype. E. Gr.: **Nakatoĝak, Mitiĝak** = He whom stones are thrown at.

The ptarmigan is a fairly common breeding bird at Angmagsalik. As to its appearance outside the breeding time it is, as in the whole of South Greenland, very varying, and is determined by conditions in the regions far to the north. The ptarmigan is a bird that is able to roam about wide areas, but to leave Greenland is beyond its powers. In the winter it wanders wherever it can find food, this explaining its fitful and quite incalculable behaviour. At Angmagsalik it may be quite lacking in winter time, whilst in other years it is met with in large numbers. As to its appearance in the first half of the year Petersen relates:—

1899, April 14th. Today I shot the first ptarmigan since November last.

1899, May 5th. Seen constantly.

1900, March 20th. At present there are comparatively not so few in the district; one morning I shot 17 here by the houses.

1900, May 9th. At present unusually large numbers; during the last few days I have bought no less than 100 from the natives.

1900, May 13th. Of a brace of ptarmigan I received today the male was already changing his plumage.

1901, June 2nd. Today I received a lot of ptarmigan, of which more than half — the females — were in full summer dress. I was therefore not surprised that in many of them there were already fairly large eggs.

1902, April 4th. I received a number today from Sarfak.

1902, April 27th. There have been quite a number here in the district lately and, according to the natives, the same is the case both at Sermilik and Cape Dan district.

1902, May 15th. Ptarmigans now seen in pairs, and the females have begun to assume the greyish summer dress.

1902, May 29th. Received several with plumage changing.

1903, March 10th. From the middle of January up to the last few days of February there were unusually many ptarmigan round here. In the vicinity of the houses alone there have on some days been shot about 50. Just as quickly as the ptarmigan arrived, they have now disappeared, and just now hardly a trace of them is to be seen, presumably owing to the deep layer of snow covering the country.

1905, June 15th. Today I received from a Greenlander 9 ptarmigan eggs, taken in Tasiusak under a dwarf willow; there were already big young in the eggs.

1906, March 14th. After not a single ptarmigan had been seen or shot for a long time, a few have lately been noticed in the district, although there are more at Sermilik, according to a native.

1908, May 12th. Ptarmigan have commenced to be quite common.

1908, June 17th. Found a nest with 6 eggs.

1909, Jan. 1st. Ptarmigan seen now and then.

1912, Jan. 1st. From December to end of February there have been many ptarmigan.

1912, April 4th. Seem to have completely disappeared.

1914, January 26th and 27th comparatively many ptarmigan seen round here, and the teacher, Olsen, asserts that while on a hunting trip one of these days he saw a flock of about 200. After two days they disappeared almost without trace (literally speaking) without our succeeding in getting many of them.

1914, Febr. 24th. There is quite a lot, comparatively.

1914, Febr. 28th. Large numbers of ptarmigan are said to be in every part of the district.

1914, March 5th. A number still seen and shot.

1914, April 13th. Still a good number.

1914, April 24th. Since the beginning of the month there have been unusually large numbers.

1915, Jan. 8th. There are almost no ptarmigan.

1915, May 26th. The female ptarmigan is now almost wholly grey, whilst the male is still pure white as in winter.

1915, June 3rd. During the day I received a pair of female ptarmigan in which there where eggs with shells, so they must presumably have begun to lay.

1924, April 1st. Hardly seen this winter, but now beginning to be seen singly.
1924, April 10th. Often seen.

Autumn.

1899, Sept. 27th. Today I received some with plumage changing from a native from Kulusuk.
1900, Sept. 29th. I shot a number today, almost white, near the station. There are many in this district just now.
1900, Oct. 30th. A number seen today near the station; they all flew towards Sermilik (N.W.).
1900, Oct. 31st. A number seen here today, but as several feet of snow are lying owing to heavy falls during the past few days, they all disappeared after having flown about the houses a while.
1901, Oct. 25th. Saw several on a hunting trip and shot some.
1902, Sept. 21st. Shot 14 myself at the mouth of Tasiusak; saw flocks of about a score.
1902, Sept. 25th. I saw from here one flock after the other fly past, all coming from the east and going westwards. On a short hunting trip in the afternoon I shot 9, saw perhaps more than 40, but they were unfortunately too shy for me to get within range of them. After having snowed during the past two days there is over a foot of snow lying.
1902, Oct. 29th. Shot a number.
1902, Dec. 11th. Hardly any ptarmigan.
1904, Sept. 19th. The ptarmigan are now almost white and at present there seems to be quite a lot of them.
1904, Dec. 26th. Only one or two seen.
1905, July 9th. Today received a nest of ptarmigan eggs — 9, taken at the east point of Tasiusak; there were half-hatched young.
1905, Sept. 20th. Unusually many in the neighbourhood just now.
1905, Sept. 23rd. Comparatively many are still being shot in this district.
1905, Oct. 14th. Ptarmigan quite disappeared again.
1905, Nov. 21st. Not seen one for a long time.
1906, Oct. 12th. Not a trace of ptarmigan just now.
1906, Oct. 20th. Yesterday and today one or two ptarmigan shot in the neighbourhood.
1906, Nov. 20th. No ptarmigan.
1907, Sept. 10th. Not a few ptarmigan seen and shot lately; mostly young birds, so that the summer seems to have been favourable to breeding owing to the dry weather.

1908, Oct. 2nd. Today I was hunting up on Orsuluiak and Sömandsfjeld and, at a height of more than 2000 feet, saw a number of ptarmigan in flocks of from 4 to 20, but they were too shy for me to get one bird. With one or two exceptions they were all in pure winter dress.
1908, Nov. 20th. One or two shot now and then.
1911, Nov. 5th. On a hunting trip today I saw only 2.
1911, Nov. 13th. One or two seen and shot.
1911, Dec. 2nd. One or two seen during the day.
1911, Dec. 10th. A number shot every day.
1912, Aug. 10th. It seems as if all the birds this summer are much earlier than usual. Ptarmigan young have already long been able to fly.
1912, Sept. 24th. One or two seen and shot; they are now almost in winter dress.
1912, Nov. 11th. One or two now being shot again.
1913, Sept. 22nd. Shot a number with plumage changing.
1913, Dec. 13th. No ptarmigan at present.
1914, Nov. 1st. On a hunting trip saw none.
1923, October. None seen during the whole month. The reason is presumed to be that there are many falcons.

From the foregoing will be seen how varied the appearance of the ptarmigan can be, and, in addition, that at certain times it appears in such large numbers that it is an important item in the supplies of the European households. The manner in which it appears at Angmagsalik is furthermore quite similar to its appearance on the west coast of South Greenland. At certain times it arrives in numbers, settles everywhere — in the immediate vicinity of the houses, too — and can disappear again just as quickly as it came. Sometimes it keeps quite low, at others high up in the mountains, usually depending upon the accessibility of its food. If there are large quantities of snow in the valleys, whilst the snow on the mountains has been swept away, it is met with high up. If the whole district is covered by a thick layer of snow, the ptarmigan cannot secure food and moves off elsewhere.

The number of ptarmigan can at times be so large that there are flocks of hundreds, but never reaches the tremendous figures with which it can — although rarely — appear in West Greenland. On the east coast it is met with everywhere in large or small numbers, and its occasionally frequent appearance in winter at Angmagsalik is easily explainable, for it migrates to the south from the more northerly areas of the east coast, irregularly, however, according to the climatic conditions. On the west coast practically the same thing applies.

The skin of a female in winter dress was sent home in 1898: Wing 188 mm., Tail 105 mm., Tarsus 30 mm.

On comparing this with ptarmigan from the west coast in similar dress it is clearly seen that it is the large Greenland race, called by Schiöler *groenlandicus*. There is hardly any doubt that all ptarmigan met with Angmagsalik belong to this race, which is easily recognisable from its size alone.

SLAVONIAN GREBE (*Podiceps auritus* L.).

Hornet Lappedykker.

Petersen has met with this bird a few times. The skin of one taken at Sarfakajik on October 8th, 1900, has been sent home; the striped head showed that it was a young bird: Wing 140 mm., Tarsus 48 mm.

The species, which is circumpolar, has its nearest breeding place on Iceland, where it is common.

HOLBØLLS GREBE (*Podiceps griseigena Holbølli* Reinh.).

Holbølls Lappedykker.

Only once has this been met with, the skin having been sent home of one which Petersen had in 1909 received from Cape Dan, where it had been shot two months before. The skin was that of an old bird in winter dress and was, as the measurements clearly indicated, of the American race, which is much larger than the European bird. Culmen 52 mm., Wing 200 mm., Tarsus 65 mm., Outer toe 80 mm. The average measurements for 6 Danish skins were: Culmen 39 mm., Wing 166 mm., Tarsus 54 mm., Outer toe 73 mm.

In colour it quite resembles the European Grey-throated Grebe, but is a giant compared with this. It breeds in Arctic North America, is seen now and then in West Greenland, but its appearance here on the east coast must be regarded as quite accidental.

GREAT NORTHERN DIVER (*Colymbus immer* Brünn.).

Islom. E. Gr.: Kardlimiortok = He who screams.

It is quite common at Angmagsalik, and is one of the few species which seem to be more common there than in West Greenland, and breeds round all small lakes. As these only thaw very late, it arrives late too, in the latter half of May, at which time it is often seen or heard on the fjord. The eggs are found in June and July, and the birds disappear in September, a few, however, being met with in October.

The typical form of the species is generally spread over Greenland, both on the east and the west coast; on the east coast it has been

found breeding as far north as in Scoresby Sound, whereas only one was seen on the Denmark Expedition. On Iceland it is a common breeding bird, as also in the western parts of Arctic North America.

Two skins of old birds in summer dress were sent home in 1895; these were presumably a pair, as the measurements also indicate:—

Wing 360 mm., Tail 70 mm., Tarsus 90 mm., Culmen 75 mm.
Wing 380 mm., Tail 70 mm., Tarsus 95 mm., Culmen 82 mm.

RED-THROATED DIVER (*Colymbus stellatus* Pont.).

Rødstrubet Lom. E. Gr.: **Kakorkak** (from the voice.)

Like the foregoing species, this is common everywhere at Angmagsalik, breeds in large numbers around the lakes. It arrives somewhat earlier than the Great Northern Diver, about the middle of May or before that time. The breeding time is, like that of the G. N. Diver, June and July; the first egg is mentioned June 10th (1913). Eggs were often brought to Petersen in July, sometimes in fairly large numbers, but most often set.

Everywhere in West Greenland and up to Upernivik the species is common, and has also been met with frequently in East Greenland up to 75° N. On the Denmark Expedition from about 77° to about 80° N. it was not seen. It is common in the circumpolar areas, and breeds at Spitzbergen, Iceland, the Faroe Islands and in eastern North America, etc.

FULMAR (*Fulmarus glacialis glacialis* L.).

Stormfugl. E. Gr.: **Kakuĝdluk.**

This species keeps to the Danmark Strait and only comes in to the coast when the field ice has disappeared, then being sometimes taken by the Greenlanders with the bird-dart. Only once, September 25th, 1908, did Petersen see it in Tasiusak itself. It is not known to breed in the vicinity.

The Fulmar is a common circumpolar species, its breeding zone stretching down to the Faroe Islands, the northern parts of Great Britain, and Norway. In Greenland it is found everywhere along the coast, breeds particularly in the northerly parts of West Greenland Along the East coast it has been met with frequently by all expeditions, but as a breeding bird only by the Denmark Expedition in lat. 81° 12′ N.; a large colony was found on a mountain there.

The skin of an old bird, blue-grey on the back, white on the wings, was sent home; it was shot in September, 1901. The measurements were: Wing 300 mm., Tail 114 mm., Tarsus 20 mm.

LAND RAIL (*Crex crex* L.).

Vagtelkonge, Engsnarre.

The Land Rail is one of the purely casual visitors to Angmagsalik, having been met with twice in all. On September 19th, 1901, Petersen received one which had been found dead close to the station in a starved condition, and October 25th, 1912, one was shot near the buildings in the colony. The bird was, as might be expected, unknown to the natives.

In West Greenland it has been met with a few times, but is otherwise a European-Asiatic form, with its nearest breeding place on the Faroe Islands and in Norway; it is not known on Iceland.

The skins of both the birds secured were sent home: Young bird, September, 1901, Wing 130 mm., Tail 49 mm., Tarsus 37 mm. Young bird, October 25th, 1912.

WATER RAIL (*Rallus aquaticus aquaticus* L.).

Vandrikse.

Only once has the species been met with, Petersen in 1903 having received a young bird, probably a female, which had been found dead at Cape Dan in the autumn. The Water Rail is common in large parts of Europe, Asia and North Africa; its nearest breeding place is on Iceland, where it is rather frequent and where some remain the winter over.

The species had not been met with previously in Greenland, but since then it has appeared on the West coast.

The skin of the bird was sent home.

COOT (*Fulica atra atra* L.).

Blishøne.

This species of the Rail family, too, has only once been met with at Angmagsalik, Petersen having received one on May 5th, 1914, from a Greenlander who had caught it on the ice a few days previously. It was very emaciated and had only a few pebbles in the stomach. A raven was hunting it when the native secured it.

On the east coast the species has been met with this once, on the west coast a few times. In small numbers it breeds on Iceland, where it is perhaps a stationary bird; presumably the East Greenland Coot came from there. Otherwise its nearest breeding place is South Norway and the British Isles, whence it would have been a very long way for this bad flyer to get to Angmagsalik. Its breeding places elsewhere are in Central and South Europe and a large part of Central Asia.

The skin of the bird was sent home.

In North America a closely related species, *Fulica americana* Gm. breeds, and this has occasionally been met with in West Greenland. The skin sent home showed, however, that the bird caught at Angmagsalik was of the European species.

LAP-WING?

Vibe?

On December 11th, 1902, Petersen writes that both on that and the previous day a bird had been seen which, according to the description, must have been a lap-wing, the cry, flight and colour agreeing; he did not see it himself.

On the west coast the lap-wing has appeared now and then, but on the east coast it is not known. The species, which breeds in many parts of Europe and Asia, has its nearest breeding places in the British Isles and in Norway, and is met with now and again on Iceland.

GOLDEN PLOVER (*Charadrius apricarius apricarius* L.)

Hjejle, Brokfugl. E. Gr.: **Angilik** = He with the patch (the black breast-shield).

The Golden Plover is no uncommon bird at Angmagsalik; it is seen every spring on swampy meadows and by small lakes. Petersen has not seen it breeding, but it is not beyond reason that it does breed there now and then, as it is always in the spring — May-June — that it is met with. The earliest time at which it has been seen is April 29th (1924) and May 4th (1902); the others were seen in the latter half of May and the beginning of June.

The appearance of the species at Angmagsalik is not surprising; on the west coast it is more often met with, and on Iceland and the Scandinavian peninsular it is a common breeding bird.

The Museum has a fine collection of skins of the Golden Plover, Petersen having sent nine home, all old birds in summer plumage.

1)	Summer, 1898.	Wing 179 mm.,	Tail 70 mm.,	Tarsus 38 mm.
2)	May 4th, 1902.	— 183 —	— 73 —	— 42 —
3)	— 27th, 1902.	— 190 —	— 80 —	— 45 —
4)	— 21st, 1903.			
5)	June 2nd, 1907.			
6) 7) 8)	no date given.			
9)	May 10th, 1924. Female.			

All the skins sent home were of the typical form. In West Greenland the American form, *Ch. dominicus dominicus* Müll., is often met

with, and there would be nothing surprising in its appearance some day on the east coast; it is unknown so far, however, as is also the race *Ch. a. oreophilus* Meinertzh.

RINGED PLOVER (*Charadrius hiaticula* L.)

Præstekrave. E. Gr.: **Kusorartek** = He with the necklace, and **Tujok** (probably from its cry).

The species is fairly common at Angmagsalik, and breeds in swampy meadows. After breeding time it is met with in small flocks. Its arrival at the Station itself is indicated by Petersen thus:

1898.	May	4th	1906.	May	20th
1900.	—	19th	1907.	—	25th
1901.	—	17th	1908.	—	17th
1902.	—	19th	1909.	—	27th
1903.	—	26th	1913.	—	25th
1905.	—	16th	1914.	—	18th (?)
			1915.	—	23rd

Like many other migratory birds, it seems to appear near the Station itself comparatively late in the season, and earlier out at the coast. The time of its arrival, however, varies only about ten days, apart from the early appearance in 1898. In September it leaves Angmagsalik (one is mentioned as late as October 3rd (1904).

It is a common breeding bird on the west coast, Iceland, Northern Europe and Africa.

No skin of the Ringed Plover has ever been sent home, but there can hardly be any doubt that the East Greenland form is the race that is also found on Iceland and called *septentrionalis* Brehm.

TURNSTONE (*Arenaria interpres interpres* L.)

Stenvender. E. Gr.: **Talivfak.**

This bird is met with at Angmagsalik in the spring — the end of May and the beginning of June, and has also now and again in the summer been shot at the end of August. Its nest has not been found, but it is reasonable to suppose that it breeds occasionally, as the Greenlanders maintain it does.

In West Greenland it breeds in the northern districts, and it has been found breeding in the most northerly parts of East Greenland. On Iceland and in North Europe it is a common breeding bird.

The skin of a young bird was sent home, shot August 22nd, 1900.

WHIMBREL (*Numenius phaeopus phaeopus* L.).

Lille Spove. E. Gr.: **Siggutak** = He of the long bill.

The species is not rarely met with at Angmagsalik; the first are seen May 10th and the last June 22nd; outside this period it has only been met with once, in July, and once in October. Now and again it is seen near the Colony, but most of the specimens have been brought to Petersen from various places in the Angmagsalik district. Usually the bird appears to be slightly shy. It might be supposed that it breeds here, but so far this has not been ascertained, nor is it known that it breeds in West Greenland, where it is also met with frequently. The East Greenland Whimbrel presumably comes from Iceland, where it breeds in large numbers; on the Scandinavian peninsular and in Northern Russia it is also a common breeding bird. On the whole it is a bird that is inclined to wander far, and it is possible that those that are met with in East Greenland are immature birds.

During the course of the years Petersen mentions sixteen shot birds received, and of these were sent home:

1) June 16th, 1901 (head only). Length of bill (after the bend) 93 mm.
2) June, 1902. Wings 245 mm., Tail 100 mm. Bill (after bend) 80 mm.
3) June, 1902 (head only). Bill (after bend) 80 mm.
4) June, 1908.
5) — —
6) July 4th, 1907.
7) May 10th, 1913.
8) 1917.
9) October 25th, 1909.

COMMON CURLEW (*Numenius arquata arquata* L.).

Storspove.

Whereas the Whimbrel, as stated above, is by no means rare in Greenland, the Common Curlew was unknown there until Petersen received the first on August 23rd, 1913. On it he writes in his diary: "Today one of the parson's sons shot a Curlew close to the houses here; it was so emaciated that I hardly think it would have lived many days longer if it were to have remained in our neighbourhood". Regarding a number of the shot specimens of the Whimbrel he writes that they, too, were emaciated, and as a matter of fact the hard ground at Angmagsalik will not provide much food for these long-billed birds. The natives explain it in another manner, as they believe that the bill continues to grow and thus makes it impossible for the bird to secure food, so that it must die of hunger.

The species breeds on the Scandinavian peninsular and in a part of Central and Eastern Europe. On Iceland it is a more occasional guest, does not breed there, but is sometimes seen in flocks. In West Greenland it was not known earlier, but in 1915 one was shot in Nanortalik in the district of Julianehaab.

The skin of the one shot was sent home and proved to be that of a young male of the same year.

COMMON REDSHANK (*Tringa totanus* L.).

Rødben.

On May 29th, 1902, Petersen received one that had been shot in the district close to Amitsuarsik, and on April 24th, 1909 another, shot close to the colony.

The species has never previously been met with in Greenland. On Iceland, whence one may doubtless presume that the East Greenland Redshanks came, it is a common breeding bird, named as a separate race, *T. totanus robustus* Schiøler. As neither of the two birds shot were sent home, it cannot be definitely stated whether they belonged to this race or to the typical form which breeds everywhere on the Scandinavian peninsular and in many parts of Europe and Asia.

PURPLE SANDPIPER (*Calidris maritima maritima* Brünn.).

Sortgraa Ryle. E. Gr.: **Sigsarmiutak.**

This bird breeds at Angmagsalik, but not in large numbers; is sometimes seen in April but usually not until May. In West Greenland it is a stationary bird in the southerly districts, but in the harsh climate of Angmagsalik it cannot pass the winter. Some, however, are met with late in the year; it has sometimes been seen late in October.

On the west coast it breeds commonly, and it has also been met with in north-east Greenland, but in smaller numbers. It is also very common all over the circumpolar areas.

KNOT (*Calidris canutus canutus* L.).

Islandsk Ryle.

This bird has only been met with occasionally at intervals of some years, in May, June, September and November.

It is one of the most northerly of all breeding birds, and has its breeding places in the far north of West Greenland, as for instance at Cape York. On the east coast it was found by the Denmark Expedition breeding at Danmarks Havn in lat. 76° N. Nowhere does it

seem to breed south of 70° N. Its name, "Islandsk Ryle" is not particularly apt, as it hardly breeds on Iceland, at any rate extremely rarely, whereas in migration time it is met with there in large numbers.

Four skins of this species have been sent home.

1) June 12th, 1900. Old bird in summer dress, with many white, badly worn feathers mixed in the breast and belly, presumably remnants of the winter plumage. Wing 165 mm., Tail 62 mm., Tarsus 29 mm.
2) August 16th, 1906. Old bird, well advanced towards winter plumage.
3) — 1st, — Young bird of same year.
4) — 16th, — Old bird.

DUNLIN (*Calidris alpina islandica* Schiøler).

Ryle.

Its appearance at Angmagsalik must be regarded as quite casual; it has been seen there in May, June and August, but scarcely breeds there. Only occasionally met with in West Greenland, whereas it has been found breeding in north-east Greenland, where Bay found it in numbers by Scoresby Sound, without being able, however, to ascertain whether it bred there or not. Nathorst found it breeding on Claveringø and Manniche in large numbers at Danmarks Havn. The species is circumpolar, but it also breeds in parts of Central Europe.

Four skins have been sent home.

1) May 27th, 1902. Old bird in partly worn summer dress, dark breast-piece with white edges on the black feathers; breast-piece not large.

	Wing 105 mm.,	Tail 45 mm.,	Tarsus 22 mm.,	Bill 24mm.
2) June 8th, 1902.	— 110 —	— 45 —	— 22 —	— 30 —
3) 1905.	— 122 —	— 41 —	— 25 —	— 29 —
4) 1908.	— 112 —	— 41 —	— 25 —	— 33 —

The Dunlins which breed on the northern part of the east coast of Greenland vary in several respects from those met with in Denmark and are regarded by Schiøler ("Nogle Tilføjelser og Bemærkninger til Listen over Danmarks Fugle", Dansk orn. Foren. Tidsskr. Aarg. 16) as belonging to another separate race which he calls *C. alpina arctica*; but those sent down from Angmagsalik are not of this race; as might have been expected, they quite agree with those breeding on Iceland, which Schiøler calls *C. alpina islandica*.

SANDERLING (*Crocethia alba* Pall.).

Selning.

Petersen has only seen the Sanderling once at Angmagsalik, on August 22nd, 1900, when it was shot close to the colony.

That this species has only been met with once proves better than anything else that the migration path of those species which breed far up towards the north in Greenland does not touch Angmagsalik at all, and that it is quite an accident when some of these species come to this district. The Sanderling breeds in large numbers in the northern parts of the east coast. Bay saw some at Scoresby Sound, where Nathorst, too, met with it; he and Kolthoff also found it breeding in large numbers at Franz Josephs Fjord. On the Denmark Expedition Manniche came across it as a very common breeding bird around Danmarks Havn in lat. 76° N. It also breeds in West Greenland, in Arctic North America, North Siberia and at Spitzbergen.

The skin of the bird shot — in winter plumage — was sent home. Wing 117 mm., Tail 50 mm., Tarsus 25 mm.

GREY PHALAROPE (*Phalaropus fulicarius jourdaini* Iredale).

Thorshane.

The same thing applies to the Grey Phalarope as to the Sanderling, that it is only very rarely met with at Angmagsalik, whereas it breeds in no small numbers further to the north on the east coast. Petersen mentions that in all he has had the species five times, once in June, once in July, twice in August and once in September. There is nothing to show that it has bred at Angmagsalik.

On the whole it is a circumpolar species. It breeds in the northern part of West Greenland, has been met with on the east coast by Kolthoff at the Mackenzie Gulf, by Manniche at Danmarks Havn, where it was commonly breeding; it not uncommonly breeds on Iceland.

Two skins were sent home.

1) June 24th, 1902. Wing 124 mm., Tail 63 mm., Tarsus 22 mm.
2) July 3rd, 1905. Very variegated and impure plumage, on the underside the red feathers here and there commencing to break out among the white and among the grey on the breast and neck.

The skins are of the slightly different race *jourdaini* first described from Spitzbergen.

RED-NECKED PHALAROPE (*Phalaropus lobatus* L.).

Odinshane. E. Gr.: **Nalumisiortok** = One who swims.

It breeds rather commonly round the gulf where the colony is situated (Tasiusak). Eggs have been found in June and July, and killed birds — both old and young — were often brought to Petersen. In August-September small flocks of 4—6 are often met with, sometimes swimming, sometimes walking on the edge of the beach.

In most parts of West Greenland it is a common breeding bird. In East Greenland it was met with by Bay at Scoresby Sound, but has not otherwise been seen on the east coast. On Iceland it breeds in numbers, and otherwise in North Europe and Siberia.

Seven skins have been sent home.

1) Sermilik. June 8th, 1902. Old bird in summer plumage; judging by the dress a female. Wing 115 mm., Tail 60 mm., Tarsus 21 mm.
2) Same place. June 8th, 1902. Old bird in very impure summer plumage. Feathers on breast with broad white edges. Wing 116 mm., Tail 50 mm., Tarsus 22 mm.
3) Sermilik. August 1902. Young bird.
4) Angmagsalik Fjord. Sept. 20th, 1901.
5) and 6) Angmagsalik Fjord. Aug. 10th, 1901. Quite young birds with down round nostrils, taken with bird-dart.
7) Sermilik Fjord. Aug. 1902. A half-grown bird with much down on the head. Wing 84 mm., Tail 17 mm., Tarsus 17 mm.

COMMON SNIPE (*Capella gallinago gallinago* L., *C. g. faerøensis* Brehm, *C. g. delicata* Ord.).

Dobbeltbekkasin, Horsegøg.

The species is one of the purely occasional visitors to Angmagsalik, but is by no means rare, Petersen having received it eight times. They were all taken late in April or May except one, which was shot in October. Of those acquired last Petersen writes: "April 30th, 1913, today a Greenlander shot a Snipe among the houses here. It was only slightly shy and comparatively well-nourished". And on May 15th the same year: "From Norajik on the Angmagsalik Fjord I received today a Snipe which had been found dead about there and had apparently starved or been frozen to death". October 1st, 1923 he writes: "The natives have today seen a bird by the stream here which, from their description, seems to have been of the Snipe family". And on October 5th the same year: "Today my assistant shot a Common Snipe on the shore of a small lake close by; this is probably the same one that was seen a few days ago".

The Common Snipe being met with at Angmagsalik (the only place on the east coast of Greenland that it is known, by the way), there may be three different species involved: the typical form, *Capella gallinago gallinago* L., the rather larger race met with on Iceland and the Faroe Islands, *C. g. faerøensis* Brehm, which differs in respect of the lighter colour on its back and by having reddish cross-stripes on the feathers at the side of the body instead of black; and finally, there is a possibility that it might be the North American species which is now

termed *C. g. delicata* Ord.; it differs from the other species in having 14 rectrices, of which the outermost is very much smaller than on the other species. An examination of the skins sent home by Petersen shows that all three races seem to be represented, five of the skins clearly being of the species *faerøensis*, which as a matter of fact might have been expected to exceed the others in numbers, whereas two are of the typical European form, and one seems to be of the North American race.

WOODCOCK (*Scolopax rusticola rusticola* L.).

Skovsnæppe.

Petersen writes on October 5th, 1906: "Today I received from a Greenlander from Sermilik a Woodcock which he had found on the shore of one of the large lakes on the road here. The bird had apparently only recently died, for it was still quite fresh and the eyes were not wholly sunken in. As it was very emaciated, I suppose it starved to death. The natives did not know the bird and had never seen it before."

The appearance of this species is quite accidental, and this is the first time it has ever been seen in Greenland. That it died of hunger is reasonable enough, as it is true of this bird as of the Common snipe and the Curlew that it is hardly possible for it to secure food very long at Angmagsalik.

It has its nearest breeding places in Norway and in Scotland, whereas it has not been found on Iceland. Strangely enough, it has been met with in North America, although it is difficult to understand how this not particularly good flyer has been able to get over the Atlantic Ocean.

The very well preserved skin of an old bird was sent home.

GREAT BLACK-BACKED GULL (*Larus marinus* L.).

Svartbag. E. Gr.: **Kusernak** (probably from the cry).

The Great Black-Backed Gull breeds in the district around Angmagsalik, but only sparsely; it only very rarely comes into the Colony itself, Petersen having seen it twice. Eggs have been brought to him in June and July, so that the bird appears to be later with its hatching than on the west coast.

In East Greenland the Great Black-Backed Gull has not been seen farther north than at Angmagsalik; in West Greenland it breeds up as far as Upernivik. On Iceland it is a common breeding bird, as well as in Northern Europe and a part of Northern Asia.

GLAUCOUS GULL (*Larus hyperboreus* Gunn.).

Graamaage. E. G.: **Kusek** (Probably from the cry).

The Glaucous Gull breeds fairly commonly in the district around Angmagsalik, and on the whole is one of the birds most frequently appearing and in greatest numbers; it breeds on the islets, as well as on the bird-cliffs, but nowhere in very great numbers. There is, however, a cliff in the Sermilik Fjord where there are hundreds of breeding birds. It is one of the few really stationary birds, as it only allows itself to be driven away by the ice, which makes its appearance at various times, but never later than the turn of the year. When there is again open water here and there in the fjords, in April-May, it returns. In the autumn, September to November, they are to be seen in numbers in Tasiusak close to the Colony itself, and a great many of them are shot. Some years they may be met with somewhat later than January 1st, as for instance was the case in 1908 and 1914.

The Glaucous Gull is a true circumpolar species, is common everywhere on the west coast of Greenland and has been found breeding all along the east coast up to about lat. 80° N. Some of them breed on Iceland, and at Spitzbergen it is a common breeding bird.

ICELAND GULL (*Larus glaucoides* Meyer).

Hvidvinget Maage. E. Gr.: **Kusek** (Probably from the cry).

Petersen does not seem to separate this bird from the foregoing one, whereas Knud Poulsen often mentions it in the Angmagsalik district.

The species is a common breeding bird in West Greenland, both to the south and to the north. On the east coast north of Angmagsalik it has only been met with more occasionally. It is principally to be found in the northern parts of America.

KITTIWAKE (*Rissa tridactyla tridactyla* L.).

Ride, Tretaaet Maage. E. Gr.: **Taterak** (From the cry).

This bird breeds at Angmagsalik but only in small numbers; is on the whole only seen occasionally, and only in one year — 1908 — did it appear more frequently. On September 25th Petersen writes about it: "A number are seen every day in Tasiusak (near the Colony), a thing that has not happened before. This is of course a consequence of the fact that this year the sea has been singularly clear of ice."

It breeds in large numbers along the whole of the west coast of Greenland, up to the most northerly areas. On the east coast, north of

Angmagsalik, it has been met with at Scoresby Sound by Bay, while on the Denmark Expedition it was seen in about lat. 80° B. The species is a circumpolar one, breeds in numbers on Iceland and in north Norway.

IVORY GULL (*Pagophila eburnea* Phipps).

Ismaage. E. Gr.: **Najavarsik.**

The Ivory Gull, which generally keeps to the open sea, seldom makes its appearance at Angmagsalik, and Petersen only mentions it on a few occasions. In the autumn of 1908 a number were seen close by the Colony. On October 23rd a number were seen by the native dwellings, and an old bird was shot. On October 31st an old and a young bird were shot at the same place, having alighted beside a piece of blubber which lay on the snow. November 12th Petersen again received a young bird.

The Ivory Gull is one of the most northerly breeding birds, a true polar species. It has been found breeding on the north coast of Greenland and on the east coast, where it was frequently seen right up to 81°, and found breeding in lat. 76° N.

In all, 4 skins have been sent home, all from the autumn of 1908.

ARCTIC TERN (*Sterna macrura* Naum.).

Havterne. E. Gr.: **Imerkitalok** = He who sprawls his legs.

The Arctic Tern breeds fairly frequently at Angmagsalik, in colonies which often number up to a thousand birds. It only very rarely comes in to the Colony itself. On June 5th, 1908, Petersen writes that he has seen them in Tasiusak for the first time in the years he has been there. Its arrival is usually about May 20th, and the eggs are laid in June. On June 11th Petersen relates having received eggs a few times.

The Arctic Tern breeds everywhere on the west coast of Greenland, as also on the north coast. On the most northerly part of the east coast it was found breeding by the Denmark Expedition up to lat. 80°20′ N. On the whole it is a widely scattered circumpolar bird, which in Europe breeds everywhere in the northern areas; on Iceland it is a common breeding bird.

A skin was sent home in 1895, that of an old bird in summer plumage. Wing 264 mm., Tail 175 mm., Tarsus 16 mm.

LONG-TAILED SKUA (*Stercorarius longicaudus* Vieill.).

Lille Kjove. E. Gr.: **Isingak, Meriarsarisek** = He who makes them vomit.

This bird, which is so often seen in northern Greenland, has only been met with once at Angmagsalik, Petersen having received one shot on September 21st, 1905, at the mouth of Tasiusak.

In West Greenland it breeds commonly in the northern areas, has been found breeding on the east coast at Scoresby Sound and Franz Josephs Fjord. At Danmarks Havn it was very common, and was seen right up to 81° N.

BLACK GUILLEMOT (*Uria grylle* L.).

Tejste. E. Gr.: **Nuerniagak** = He whom one catches with the bird-dart.

The Black Guillemot is one of the more common birds at Angmagsalik, breeds here and there in the district in no small numbers, and is a stationary bird, inasmuch as it holds out as long as there is open water or even openings in the ice, and only yields when the waters are entirely frozen over. In the severe months after the turn of the year it is one of the few birds met with in the district, as it is able to live even in the small openings which are constantly being formed in the Angmagsalik Fjord, which is so rich in current openings; indeed at times an opening on a stream is sufficient for it. But in any case it is only found in small numbers in winter. As soon as open water appears in the fjord or by the coast in May, the Black Guillemot again arrives in large numbers. Breeding time is not until June, at which time Petersen has often received eggs. In the autumn it keeps in to Tasiusak in fairly large numbers, 24 having been reported shot on one day (October 29th, 1902).

Everywhere along the west and north coasts of Greenland the Black Guillemot is a very common breeding bird; has also been seen breeding in the northerly parts of the east coast. Manniche found it breeding in about lat. 70° N. and above 80° N. it was seen on the Denmark Expedition. It breeds everywhere by the coasts in the northern seas, distributed in several races. As Petersen has not sent any skins home, it cannot with certainty be decided to which race the Black Guillemots at Angmagsalik belong; presumably they are of the race *grylle grylle*.

BRÜNNICHS GUILLEMOT (*Uria lomvia lomvia* L.).

Brünnichs Tejste, Kortnæbbet Lomvie. E. Gr.: **Sarigsek** = He of the beautiful front.

This bird does not breed in the Angmagsalik district, is mostly met with in the autumn and winter, sometimes in very small, at other times in large numbers. On November 5th, 1900, Petersen writes that he saw many in Tasiusak, flocks of up to twenty. March, 1906 a number of openings suddenly appeared in the field-ice on the coast, and big crowds of Guillemots unexpectedly appeared wherever these openings were to be found, both in Angmagsalik Fjord and in Sermilik Fjord. That day Petersen received about ten birds from the neighbours. On March 16th he received more than 30 from Cape Dan and the adjacent settlements. The natives had been hunting them and are said to have taken up to 40 birds per man with the bird-dart. In 1909 Petersen writes on January 1st that there have been large numbers during the past weeks, and that scores have been shot in Tasiusak. During the whole of January and February of 1914 they were numerous everywhere, on the fjords at Angmagsalik and also at Sermilik — at the end of February they were so numerous that the natives could get as many as 40 to 50 a day. On March 5th they had disappeared. In December, 1914, and the beginning of January, 1915, there were again large numbers, the Greenlanders at the farthermost settlements at the Sermilik Fjord obtaining up to 60 a day with the bird-dart. There was such an abundance that the birds were even used to feed the dogs.

On the west and north coasts of Greenland the species breeds very commonly, has been found breeding on the east coast at Scoresby Sound, whereas on the northern part of the east coast it was only seen once by the Denmark Expedition. In reality the race is one of those breeding farthest north, breeds at Spitzbergen, Novaja Semlia, Franz Josephs Land, Iceland and on the coast of Labrador.

LITTLE AUK (*Alle alle* L.).

Søkonge. E. Gr.: **Kutulak, Kutsularajik** = The little one.

This bird hardly breeds in the Angmagsalik district, comes there only as a winter visitor, sometimes in large numbers, at other times only a few. It appears in October and is frequently seen in November-December, sometimes holding out till into January. Petersen writes on January 1st, 1909: "During the past two or three weeks there have been a lot of sea-birds, particularly Little Auks and Brünnich's Guillemots, in all parts of the fjords; even in Tasiusak scores of them have been caught or shot every day." And on January 8th, 1915: "A number of

Little Auks are to be seen." Petersen has been informed by the Greenlanders that the Little Auk breeds at the Sermilik Fjord, but this is uncertain.

The Little Auk breeds in large numbers in the most northerly parts of the west coast of Greenland and also on the north coast — without doubt on the northern parts of the east coast too, even if the breeding places there have not been found. Bay saw it in large numbers in Scoresby Sound, and those birds which come to Angmagsalik in the winter are undoubtedly hatched further to the north in East Greenland.

It is one of the most northerly breeding birds, has its breeding places in the most northerly parts of North America, at Spitzbergen, Novaja Zemlia and Franz Josephs Land; its most southerly breeding place known is on Grimsey, north of Iceland.

GREAT AUK (*Alca impennis* L.).

Gejrfugl. E. Gr.: Isarukitek.

That the Great Auk has lived at Angmagsalik is shown by what G. Holm reports. During his sojourn at Angmagsalik in 1884—85 it was said that "the grandfather of a man then living had caught an Isarukitek (Great Auk), of which it was related that it was a very large bird which had quite small wings with short feathers, and that it could remain just as long under water as a big seal".

That the memory of the bird is still alive among the Greenlanders is evident from the fact that Petersen writes in 1896: "According to the Greenlanders a Great Auk was seen near the island of Ingmikertok in the Angmagsalik Fjord about six years ago. The man who had seen the bird said that it was as large as a Great Northern Diver, but could not fly. He had hunted it together with another Greenlander, but as it was in the autumn and the sea rather rough, it got away."

PUFFIN (*Fratercula arctica* L.).

Lunde, Søpapegøje.

The appearance of this bird at Angmagsalik is quite accidental. Petersen has received it twice, the first time in 1907 and the second time in January, 1909, when from Sermilik he received a young bird which had been taken with the bird-dart a day or two before. The natives did not know the bird, nor had they even a name for it, so that it must be very rare.

On the West Coast the Puffin breeds commonly apart from the southern parts. On the whole of the east coast there is no record of its having been met with elsewhere than at Angmagsalik. On the other

hand it is well known as a breeding bird on Iceland, and presumably those shot at Angmagsalik came from there and were of the typical form *F. a. arctica.*

CORMORANT (*Phalacrocorax carbo carbo* L.).

Skarv. E. Gr.: **Aluglulekangitikajik** = He without tongue.

It is said to have bred at Sermilik Fjord, where natives have shown Petersen its former breeding place. It is seen occasionally in winter.

The Cormorant has not been met with elsewhere on the east coast beyond that Graah mentions it in the southern part. On the west coast it is a common breeding bird, and it also breeds in all parts of Northern Europe and Asia, and in Labrador.

MERLIN (*Falco columbarius æsalon* Tunst.).

Dværgfalk.

On July 8th, 1914, Petersen received from the Angmagsaet place a Merlin which had been shot a few days before, presumably July 2nd or 3rd. The bird was a year old, in the grey-brown dress of the young bird, but among the very worn feathers there were here and there a few new, grey-blue feathers, showing that the bird was a young male about to assume the plumage of the old bird.

A bird which the natives had seen on June 13th, 1908, chasing small birds and catching a Ringed Plover in flight has presumably been a Merlin rather than a Sparrow-hawk, as Petersen thought from the description.

This is the only time that the Merlin has with certainty been met with in Greenland, except on an occasion when it is stated that a young male of the European race was shot on May 3rd, 1875, at Cape Farewell and sent by Wiepken to Kumlien; it is reasonable to suppose that it was shot at sea, on board the ship. It breeds in all parts of Northern Europe and a part of Asia, and has its nearest breeding place on Iceland, where it is fairly numerous.

PEREGRINE FALCON (*Falco peregrinus anatum* Bp., *F. p. peregrinus* Tunst.).

Vandrefalk. E. Gr.: **Napalikitek** = He of the short neck.

There is nothing surprising in the fact that the nomadic Peregrine Falcon has reached Angmagsalik too. It breeds there, although sparsely, and is only met with at intervals of years. Petersen saw one on October 7th, 1901, and after that it is not named until May 26th, 1909, when he received one from a Greenlander who had shot it on the nest with

two eggs at Ignortalik, on the west side of the Sermilik Fjord. The nest was on a gull-cliff, and the eggs, which the Greenlander had eaten, were quite fresh. On June 11th, 1912, he received a male which had been shot by the nest in Tasiusak, north of the Angmagsaet place, where it is said there had been a breeding place for many years. The female was also shot.

On July 1st, 1924, Petersen received from Kekertulok, south of Sermilik, two eggs of the Peregrine Falcon taken some days before together with two others (the nest having contained four eggs, two of which however had been broken in transit). The eggs were quite fresh. Both parents were shot with the gun and were not brought to Petersen.

The skins of both were sent home, and that shot in 1909 proved to be a mature but not very old bird which, with its unspotted breast, closely resembled the American form, whereas the one shot in 1911 was more like the European form.

On the east coast the Peregrine Falcon has otherwise only been met with in the most southerly parts, where Petersen frequently saw it in October-November, 1893.

In West Greenland the American race breeds commonly; the European race breeds in many parts of Europe and Asia, and has its nearest breeding places in North Norway. There is nothing strange in the fact that both the American and the European forms are met with in East Greenland.

GREENLAND FALCON (*Falco rusticolus candicans* Gm., *F. r. islandus* Brünn.).

Jagtfalk. E. Gr.: **Napalikitek** = He of the short neck.

The Greenland Falcon as a breeding bird is only rare in the Angmagsalik district. Petersen mentions twice that he has received reports of its breeding, in 1908 at Tasiusarsik (Holm's winterquarters) just to the north of Angmagsalik, and in 1917 in Tasiusak in the Angmagsalik Fjord from which place he received two fully fledged young. It also agrees with the rare occasions on which it breeds that it is only rarely seen in the spring or summer months; it is only once or twice mentioned as seen in April-May, not at all in June-July, and only once in August. In the autumn and winter the position is different; many are seen then, but there is, by the way, a considerable difference between their number in the earlier and more recent years during which Petersen has lived at Angmagsalik. From 1896 to 1903 Falcons were often seen by the Station in the months of September to December; the report says that several were seen one day, and some days many. Since these years, however, their appearance has been much more frequent. Petersen him-

self connects this with the fact that in that year he started to keep pigeons, but this can hardly be the reason, even if some of the Falcons in the district were enticed to the vicinity of the dwellings by these pigeons. As a rule — in the later years too — the Falcon appears in September and remains until December, in other words as long as there are Ptarmigan or sea-birds on the open water. They are, of course, also grateful for smaller birds; Petersen writes on November 6th, 1911: "Today a number of Falcons were seen round here, and a few Snow Buntings, which the Falcons naturally hunted." And on October 15th, 1904: "During the past few days many Falcons have been seen every day, hunting the few Snow Buntings and Greenland Redpolls which are still to be seen here in small flocks." On April 26th, 1913: "Today I shot an old male which was hunting the small birds." Once Petersen mentions that a Falcon was after his poultry. But in the winter, when there are neither Ptarmigan nor small birds, and the fjords are ice-covered so that the sea-birds are gone, it is not easy to understand how these big birds of prey live. Petersen writes on December 13th, 1913: "Several Falcons are still seen daily, and one is shot now and then; at Sermilik, from which place we had a visitor the other day, there are said to be exceptionally many, which almost makes one wonder, as there are no Ptarmigan there at all just now, nor any sea-birds — at any rate hardly any are seen and shot." The explanation of how the Falcons live must be that they seek their food out in the open sea beyond the belt of ice. A trip of a few miles means little to a flyer like the Falcon.

That the number of Falcons must be connected with the presence of the Ptarmigan seems sometimes to appear with great certainty. In the autumn of 1911 there were large numbers of Falcons, both at the Colony and northwards along the coast. In March, 1912, Petersen writes: "From December to the end of February there have been many Ptarmigan; this is certainly the reason why there have been so many Falcons here all the winter. Since my return here (end of August, 1911) I have myself shot no less than 27 of these birds, but could have had twice that number had I not shot badly." At other times, however, the connection seems less distinct. In December, 1913, and January, 1914, there were large numbers of Falcons but no Ptarmigan, and no great numbers of sea-birds. On November 28th Petersen writes: "During the past fourteen days many Falcons have been seen here and numbers have been shot, some by myself and some by the natives. It is not too much to say that since the beginning of the month one to ten Falcons have been seen here every day. Although there are practically no Ptarmigan in the neighbourhood, all the Falcons so far shot have been very — indeed unusually — fat.

In the beginning of December, 1913, there were, as already men-

tioned, many Falcons but no Ptarmigan. Later on in that month a number of sea-birds, however, arrived, and from the middle of January, 1914, the Ptarmigan became numerous. In the autumn of 1923, too, there were a lot of Falcons but no Ptarmigan, so that the connection between the appearance of the two species is not quite clear.

From the 8 Falcon skins which Petersen has sent home it appears that the Falcons in East Greenland are the same as those in West Greenland; there are representatives of the light and dark form of the race *candicans* and one skin of the grey *islandus*.

SHORT-EARED OWL (*Asio flammeus flammeus* Pont.).

Mosehornugle.

This roving bird has also been shot once at Angmagsalik, May 29th, 1908. It was shot by the houses, where it came flying, pursued by a swarm of small birds. In the stomach was a piece of skin and some hair of a newly-born seal. The skin of the bird was sent home.

The race has been met with a few times on the west coast, and as a breeding bird is common over a large part of Europe, Asia and the most northerly part of America. It roams over wide areas and is fairly common on Iceland, although not yet proved to have bred there.

SNOWY OWL (*Nyctea nyctea* L.).

Sneugle. E. Gr.: **Kialik** = He of the face.

It is not known with certainty whether the Snowy Owl breeds in the Angmagsalik district or not; there is no definite evidence, but the bird is by no means rare, although it is mostly in the winter and spring months that it is met with. Petersen has often seen it himself and, in the course of time, received no less than 23 shot specimens. Of the 38 times he has seen or received the Snowy Owl, 33 were in the period September-April, 4 times in May, once in June. It is met with by the Colony itself, in the mountains, and also on ice hummocks out on the water. As a rule it is met with singly, but sometimes several may be seen together. Petersen writes on February 2nd, 1924, that he received a young Snowy Owl, shot at Sarfak, where two others were seen, of which one was quite white. At Sarfak there is a large current opening, as indeed the name implies, and there are usually many birds there during the winter, especially Black Guillemots.

In the northerly part of the west coast and on the north coast the Snowy Owl is a common breeding bird. It is also met with in all parts of the east coast. On the Denmark Expedition, which by the way found no nest of the species, it was seen as far north as lat. 82°50′ N.

On this expedition Manniche saw about 60 Snowy Owls. It was found breeding on the east coast by Kolthoff at Mackenzie Bay. The species is circumpolar, breeds in northern Europe and Asia and in Arctic North America.

WHITE TAILED EAGLE (*Haliaëtus albicilla* L.).

Havørn. E. Gr.: **Nağtoralik.**

Petersen writes in 1896 that the Eagle is known to the Greenlanders, but that he had never seen it himself, nor did he do so all the time he was in Angmagsalik. On July 22nd, 1913, he reports that a number of children who were fishing for salmon by the river had seen a large, dark bird which, judging by the description they gave, may be presumed to have been an eagle. The Greenlanders state they have seen it hunting small seals.

In East Greenland the Eagle is only mentioned by Graah and Vahl from the most southerly portion; has not been met with north of Angmagsalik. It is to be found in many parts of North and Central Europe and Northern Asia; a few pairs breed on Iceland. The Greenland Eagle is described as a distinct form and called *H. a. groenlandicus* Brehm.

ROOK (*Corvus frugilegus frugilegus* L.).

Raağe.

The appearance of the Rook is quite casual. Petersen writes on March 23rd, 1901: "Today I received from a Greenlander a Rook which he had shot on March 20th at Kangarsik, near Cape Dan."

This is the only time the Rook has ever been met with in Greenland. It breeds over the greater part of Central Europe and also of North and Central Asia. Its nearest breeding place is Scotland, but it is a bird which roams widely; in Norway, where it only breeds here and there in the southern part of the country, it has been met with as far north as Vardø, in lat. 70°22′ N.; in the Faroe's it appears in spring and autumn, often in hundreds; it likewise comes to Iceland now and then in large flocks.

The skin of the bird was sent home.

HOODED CROW (*Corvus cornix cornix* L.).

Krağe.

The same applies to the Hooded Crow as to the Rook, that its appearance is quite casual. It has been shot twice at Angmagsalik, May 19th, 1897 at Cape Dan and at the end of May, 1907 at Sermilik. Other-

wise has not been met with in Greenland. It breeds in large numbers all over Northern Europe and the eastern parts of Central Europe. It is only rarely met with on Iceland.

The skins of the two shot birds were sent home.

RAVEN (*Corvus corax* L.) (*principalis* Ridg.)?

Ravn. E. Gr.: **Kernertok** = The black one; **Karlutok** (from the cry).

The Raven is a fairly common breeding bird at Angmagsalik and is one of the few stationary birds there, it often being seen all through the winter. During the whole of the autumn up to the new year it is common, sometimes in flocks of 20—30. In the severe winter period from January it is often very sparse in number, some years entirely absent, while in other years it is present in fairly big numbers, even in flocks. Petersen writes on March 15th, 1913: "During most of the winter there have been exceptionally many Ravens at the shark-holes (holes in the ice where sharks are fished). There have been days when we have seen as many as 30 at once." As elsewhere, the Raven here is one of the earliest breeding birds, Petersen having received a clutch of eggs taken on April 23rd, 1914, and he writes of a nest with newly hatched young, found on May 10th, 1907.

The Raven is one of the most widely-spread birds in Greenland, and seems to be almost equally common on the east coast as on the west coast. It is also spread over Europe, a part of Asia and North America.

The Raven found in West Greenland is the American race *C. c. principalis* Ridgw., which differs from the typical form by a longer and thinner bill, etc. Whether the Raven which is so common at Angmagsalik belongs to this or to the typical European form is uncertain, as no skins have been sent home; presumably, however, it is the race *principalis.*

MARTIN (*Delichon urbica urbica* L.).

Bysvale.

Only once has this bird been seen at Angmagsalik, Petersen having sent home the skin of an old bird, shot at Sermilik Fjord in June, 1902. He writes on June 13th: "Yesterday and today a swallow was seen round here by the parson who has seen it and knows it from Denmark," and on June 26th: "I received one today from Sermilik; it does not seem to have lacked food, it being very fat and the alimentary canal was quite full of gnats and perhaps other insects too." One may suppose that it was the same bird that was seen on both days.

The species is new to Greenland, and breeds nowhere nearer than

in Scotland, is now and then met with on the Faroe Islands and on Iceland; in Norway it breeds up to lat. 70° N., is otherwise spread over a large part of Europe and Asia.

SWALLOW (*Hirundo rustica* L.).

Forstuesvale.

The only information to be found about the Swallow is that the skull and the upper part of the bill were sent to me, marked "Sermilik, summer 1904". What was sent was, however, enough to determine the species and to show that it was a young bird.

This is the only time the species has been met with at Angmagsalik; on the southern part of the east coast a Swallow was shot in September, 1893, presumably of this species, but the skin was not preserved. In West Greenland both the European and the American race *H. r. erytrogastra* have been met with a few times; to which of the races the one sent home belongs is impossible to determine, but probably it was a European bird.

The Swallow is common as a breeding bird over the most of Europe and Asia; its nearest breeding place is Norway, where it nests as far up as the most northerly districts, and the British Isles. It comes regularly to Iceland every year, and presumably it has bred there too.

STARLING (*Sturnus vulgaris vulgaris* L.).

Stær.

In all Petersen has five times received a shot or caught Starling. The first was shot at the Colony on October 27th, 1896. As to the others Petersen reports November 4th, 1896: "I received today from a young Greenlander a starling, which he had taken on the 31st of the previous month at the Greenlander House in the Colony. He had found it in a dying condition. A few days before a Greenland girl, who was visiting the colony, had seen a strange bird which, according to the description, must have been the same Starling, sitting on the roof of the house of the Colony Manager." May 5th, 1901: "From a Greenlander I received today the head of an old Starling which had been shot at Nunakitit at Cape Dan a few days before. The reason why he only brought the head was that he had smashed the body with his shot." January 2nd, 1907: "Today I received from Sermilik a Starling which was shot there about Christmas or shortly before. The bird was not emaciated, probably because it had been able to find food on the beach at low water. The fjord is not yet covered by ice and the beach, where there is a slight current, is more or less free of ice. When the Starling was shot it was

sitting upon a laid-up skin-boat." March 3rd, 1915: "I received today from a man from Sermiligak a Starling which he had caught by hand at one of the settlements up there some time in the autumn, presumably about the end of September or the beginning of October."

Thus the Starling goes astray occasionally and arrives at Angmagsalik, its habits from other places leading it to stay around human habitations.

On the east coast the Starling is only known at Angmagsalik, on the west coast it has been met with once. Its nearest breeding place is the Faroe Islands, where a separate race is to be found, but to which the Greenland Starling does not belong. It is a breeding bird in most parts of Europe and a part of Asia, breeds in Norway as far up as the most northerly areas of the country. The Starling is seen on Iceland now and then, and during the past few years every autumn in small flocks at Eyrarbakki in Southern Iceland, according to P. Nielsen. It might possibly be imagined that the East Greenland Starling, of which three of them were also met with in the autumn, were of the same origin as those found at Eyrarbakki.

The following skins were sent home:

1) 27th October, 1896. Winter plumage. Wing 129 mm., Tail 70 mm., Tarsus 31 mm.
2) 30th October, 1898. Winter plumage. Wing 130 mm., Tail 67 mm., Culmen 22 mm.
3) 5th May, 1901. Head of bird in summer plumage with yellow bill. Culmen 22 mm.
4) Christmas 1906. Old bird in winter plumage.
5) 1st October, 1913.

MEADOW PIPIT (*Anthus pratensis* L.).

Engpiber.

The Meadow Pipit is a scarce breeding bird at Angmagsalik, does not appear every year. Petersen had lived there several years without observing it; not until 1903 does he mention it in his diary. On May 21st he saw four or five by the houses, shot and sent home one for purposes of identification. He still saw them in May-June, and in July he saw them with young. On a trip to the Sermilik Fjord at the beginning of June he saw them there too, in pairs, and to all appearances they had nests in the vicinity. After that he does not mention them until 1908, when on May 9th he saw one among the houses of the Colony; he saw it again on May 12th and heard it sing. In 1912 one was seen on May 5th. On June 11th it was reported that one was singing on the mountains all day, and at the same place one was seen on July 13th,

with its bill full of insects, comporting itself in such a way that it obviously had young in the vicinity. On August 10th both old and young birds were seen near the Colony. In 1913 it was not seen until May 12th. That it was not merely for a few years that the Meadow Pipit stayed round Angmagsalik is seen by the fact that Petersen, after eight years' absence, returned in August, 1923, and saw it immediately on his arrival. Later he only saw it once, on October 10th, when one was seen flying in an easterly direction.

In East Greenland the species is only known in Angmagsalik while from West Greenland there is only one report of its appearance. It is widely spread as a breeding bird in most parts of Europe and a large part of Asia. The East Greenland Meadow Pipit without doubt comes from Iceland, where it is a very common breeding bird.

REDWING (*Turdus musicus coburni* Sharpe).

Vindrossel.

Petersen has received three birds of this race. On October 20th, 1904 two were shot by the Colony. They were flying from one ice-floe to another down by the beach, looking for food, and every now and then they made a trip to the shore, where they doubtless caught sand-skippers, small snails, etc. They were only slightly shy and easy to shoot. On October 31st, 1906, he received one from a Greenlander who had shot it on the beach.

It is not known in other parts of the east coast, but has been met with a few times in West Greenland. Its breeding places are in Northern Europe and a part of Northern Asia. In Norway it is a very common breeding bird, as also in the Icelandic birch thickets.

Three skins have been sent home. They apparently belong to the race living on Iceland, which is called *T. m. coburni* Sharpe, and differs from the typical form by being rather darker in colour on the back. The justification for regarding the Icelandic form as a distinct race has been disputed, and at any rate the deviations from the typical form are only small.

WHITE WAGTAIL (*Motacilla alba alba* L.).

Hvid Vipstjert. E. Gr.: **Erkorkortok** = He of the long tail.

This bird, too, breeds at Angmagsalik, although only in small numbers. It was met with there as early as in 1885 by Holm's Expedition, and was seen by Petersen in the spring of 1895. In 1899 it was seen every day during nesting time in July-August, and on August 21st Petersen saw a young bird. It appeared for the last time on August

31st. On May 15th, 1900 a Greenlander from Sermilik reports that three were seen there about two days before, and on June 12th Petersen saw one by the Colony. One was shot at the same place on June 10th, 1915.

The species is only known with certainty on the east coast at Angmagsalik; it has been met with once on the west coast. The same is true of this bird as the foregoing, that it is widely scattered over Europe and Asia and is a very common breeding bird on Iceland.

GREENLAND WHEATEAR (*Oenanthe oenanthe leucorrhoa* Gm.).

Digesmutte. E. Gr.: **Ingersiak** = He who swings.

This is one of the commonest birds at Angmagsalik, arrives towards the end of April or the beginning of May and remains until September, although some remain until October. Indeed, one or two have been found in the beginning of November. There is quite a lot of data as to its first appearance:

1895. Last days of April.
1898. (April 14th at Cape Dan, according to the natives).
1899. May 5th.
1900. — 5th (April 24th at Cape Dan, according to the natives).
1902. April 27th (April 10th at Sermilik, according to the natives).
1903. — 24th.
1905. — 26th.
1906. May 8th.
1907. — 8th.
1908. April 19th.
1909. May 1st.
1912. April 23rd (according to the natives as early as April 17th).
1913. — 26th.
1914. — 24th (according to the natives April 17th).
1915. May 5th, seen by natives.
1924. — 2nd.

It often happens that some time elapses between the appearance of the first and those that come later, and it is a frequent occurrence that in the spring, after the arrival of the Wheatear, bad weather arrives with frost and snow, and the birds have a bad time, and die. Petersen writes on May 16th, 1902: "Since yesterday we have found by the houses no less than 4 Wheatears. As the weather for a long time has been raw and rainy, I suppose that this, combined with the lack of food, is the cause of the many deaths among them." In 1903 matters were no better when the Wheatear arrived. On April 24th Petersen writes: "How it will manage is a problem to me, as there is not one spot free of snow for miles around." And on May 10th the same year: "It is doubtless

having difficulty in securing food, or perhaps it is the cold that is too severe, for during the past few days dead ones have been found among the houses." On May 9th, 1908, we read: "It has not been observed since April 19th. The reason is certainly the mass of snow and severe frost we are having just now."

Petersen does not say much regarding the bird during breeding time, but one may take it for granted that there is not much variation from the conditions as we know them elsewhere.

The Wheatear remains there until well into the autumn, as Petersen reports:

1898. October 16th, one or two stragglers; 29th, (Country covered with snow), one seen.
1899. September 27th, a few seen every day.
1900. October 9th, still seen often in our neighbourhood; 15th, a few stragglers; 31st, one seen (snow lying several feet high); November 5th, the last one seen.
1902. October 5th, one or two seen occasionally at the Station; 18th, the last one seen.
1905. October 4th, a few still seen, although the country is thickly covered with snow.
1906. September 20th, only one or two seen; October 12th, two seen.
1908. October 2nd, still seen; 14th, one seen close to the Colony; 24th, I saw one during the day; the country is covered by a thick layer of snow.
1911. October 29th, one or two still seen occasionally.
1912. September 20th, only one or two seen at intervals of some days; 20th, I saw one today; the country is being covered with snow.
1913. September 20th, only one or two still seen.
1914. October 13th, the last seen. A large quantity of snow fell. As late as November 9th one was seen by the houses, although the country is entirely covered with snow.
1923. October 5th, one or two seen every day; 8th, one or two seen.

Only one skin of the Wheatear has been sent home, that of a young bird in first winter plumage, in size just the same as the form appearing in West Greenland, North America and Iceland, *O. o. leucorrhoa*, rather bigger and a little longer in the wings than the typical form, which it otherwise resembles in all essentials. In many of the races that are nowadays classified it is doubtless difficult to find any perceptible difference in the mode of living, but it seems clear enough that the Wheatear that lives in Angmagsalik is another form than the one we have in Denmark. In Denmark the Wheatear is a bird that does not expose itself to the harshness of winter. The average time of its appearance here is April 10th to 15th, while after the middle of September most of them

have gone. What a difference there is between this and the Wheatear at Angmagsalik, which recklessly braves frost and snow, even though it sometimes means death.

In all parts of the west coast the Greenland Wheatear is a common bird, is one of the most frequently appearing small birds, while on the east coast it has been met with by all expeditions. It was only once seen, however, by the Denmark Expedition, so that it would seem that it does not go right up in the most northerly areas.

GREENLAND REDPOLL (*Carduelis linaria rostrata* Coues).

Graasisken. E. Gr.: **Kakormiutak, Tutulak** = The mountain dweller; **Pivek** (from its cry).

The form of Redpoll commonly appearing in Greenland also breeds in numbers at Angmagsalik, and is one of the most common birds there. It is one of the heralds of spring, appearing in April, sometimes in the first half of the month, although there are years when it does not arrive until May. The following dates of arrival are given:

1895. Last days of April.	1907. April 10th.
1898. April 17th.	1909. — 9th.
1899. May 15th.	1912. May 17th.
1900. April 15th.	1913. April 30th (according to the natives).
1902. — 12th.	1915. May 4th.
1905. — 24th.	1924. May 5th.
1906. May 4th.	

As a rule the birds depart at the end of September. Through the years there are many reports from Petersen as to the Redpoll having been seen in October, and in good numbers, while in November a few together and in small flocks were seen. In 1924, on December 6th, one was seen, but a number of these reports have undoubtedly to do with the following form.

Among the 6 races of the Redpoll so far claimed the common Greenland Redpoll is one of the largest and has the largest bill; it is recognisable from this and from the darker colour than the other forms, all of which must be considered as circumpolar except the very small form which lives in the mountain districts of Central Europe.

Four skins sent home, of two males and two females (probably two pairs) dated June, 1901, are clearly of the race *C. l. rostrata.*

1)	Male.	Wing 83 mm.,	Tail 67 mm.,	Tarsus 17 mm.,	Culmen 9 mm.
2)	—	— 80 —	— 63 —	— 17 —	— $8^1/_2$ —
3)	Female.	— 75 —	— 58 —	— 15 —	— 8 —
4)	—	— 75 —	— 60 —	— 16 —	— 8 —

HORNEMANN'S REDPOLL (*Carduelis hornemannii hornemannii* Holb.).

Hvidsisken. E. Gr.: **Ukiortak** = He who remains the winter over.

Besides the occurrence of the Greenland Redpoll, in the north of Greenland there is a closely related form, Hornemann's Redpoll, which is sometimes regarded as a race of Greenland Redpoll but is so different that it can doubtless be called a species. It has indeed been classified as such by Holbøll, the first to describe it and give it the name *Fringilla Hornemannii*. As a breeding bird it is limited to the most northerly parts of Greenland. A smaller race, *C. h. exilipes*, breeds in northern America and in Asia.

Petersen writes that the Hornemann's Redpoll does not breed at Angmagsalik and is not seen in summer, but is common in October-November. Regarding this he says: "The form appearing in this district is the dark one, but the lighter form is also seen now and then, especially towards winter. Hitherto I have regarded the latter as being identical with the former and have thought that the lighter plumage was the winter dress, as all Greenlanders maintain." At my request he shot one and sent it to me; true enough, it proved to be *C. h. hornemannii*.

It inhabits, as already stated, the northern parts of Greenland. Where the dividing line between it and the Greenland Redpoll is to be found on the east coast cannot be stated with certainty, but those that have been met with by expeditions in the northern part of the east coast have been this form. It is commonly found at Scoresby Sound, now and then in Franz Josephs Fjord. Two were brought home by the Denmark Expedition, but only very few were seen at all.

The skin sent home showed the following measurements: Wing 85 mm., Tail 65 mm., Tarsus 16 mm., Culmen 8 mm.

SNOW BUNTING (*Plectrophenax nivalis subnivalis* Brehm.).

Snespurv. E. Gr.: **Pisek, Piserajek.**

Of all the small birds, the Snow Bunting is without doubt the commonest at Angmagsalik, and also the first to arrive of the small birds in spring, and the one that stays longest in the autumn. Often winter is still prevailing when it arrives. Petersen has a very fine series of notes as to the times of its arrival.

1895. March 13th, a few; flocks seen in the beginning of April.
1896. April 15th, seen; according to the natives, seen at the end of March.
1899. April 14th, seen; according to the natives, seen April 4th at Sermilik, 5th and 6th at Cape Dan.

1900. March 31st, seen (seen by others as early as the 21st); April 5th, seen daily in the neighbourhood; April 22nd, seen every day in small flocks of 3 and 6. Most of them are not in full summer plumage.
1901. March 19th, two seen in winter plumage.
1902. March 30th, one came flying from the East, settled a moment on a small land-mark on the so-called Owl-cliff and then continued its flight to the West; April 7th, another seen today; April 12th, the Snow Buntings have now paired.
1903. March 27th, today the first was seen flying westwards. (According to the natives it was seen March 17th).
1905. March 17th, the first one seen. From March 19th they were common.
1906. April 8th, seen for the first time here at the Station, but the Greenlanders think they heard it several days ago; April 15th, now seen in small flocks.
1907. April 1st, the first seen; April 10th, a large number flew westwards and among one large flock was seen a Greenland Redpoll.
1908. April 12th, today I succeeded in seeing the Snow Bunting. At this time it is certainly with difficulty that it can secure food, as the country is still everywhere covered with enormous masses of snow. (The natives have seen it by the Colony on April 4th, at Cape Dan on April 1st).
1909. March 31st, seen for the first time. (By the natives at Cape Dan on March 21st).
1912. March 19th, the first ones seen. (At Cape Dan several days ago, according to the Greenlanders).
1913. March 16th, the first ones seen.
1914. February 10th, one was seen today by the houses; 24th, one or two seen. At Cape Dan several were seen together by the natives; March 5th, one seen constantly by the houses; 19th, two seen, but no more were seen until April 13th, so that the very early ones must have been casual roamers.
1915. One had spent the winter here. The first seen March 27th. (Said to have been seen by the Greenlanders at Sermilik several days before).
1924. March 15th, the Greenlanders saw one today by the houses; 31st, one seen here today, but it immediately continued its flight westwards. Since the 15th it has not been seen here until now. At Cape Dan it is said to have been seen some time ago; April 10th, I saw three today by our house.

Various notes have also been made as to its song and nest-building.

1898. April 15th, sang for the first time since their arrival.
1901. — 15th, sang for the first time.
1902. — 12th, have now paired and, according to the natives, started to sing several days ago.

1903. April 18th, sang for the first time this year.
1905. — 4th, sang.
1906. — 20th, —
1907. — 12th, —
1908. May 9th, —
1909. April 24th, —
1912. — 4th, —
1913. — 5th, —
1914. The bird that arrived early sang on March 19th. The others did not sing until April 24th.
1924. April 14th, sang for the first time since arrival.

As to its appearance in the autumn, its departure or sojourn during the winter, there are also copious notes.

1898. October 16th, some few stragglers seen; 25th, two seen; 29th one, and November 24th the last.
1899. September 27th, one or two still seen every day; October 14th, one seen; November 24th the last.
1900. October 9th, still seen frequently in the neighbourhood; 15th, a few stragglers; 31st, a number seen by the Station, but as there were several feet of snow on the ground, they all disappeared after having hung about the houses for some time; November 7th, the last seen.
1901. October 25th, a few seen; November 10th and December 11th, one seen.
1902. September 25th, still seen in large flocks round about here; October 5th, only one or two seen now and then at the Colony; 18th, 4 seen; November 11th, a few still staying round among the houses, are quite tame.
1904. September 1st, since our arrival (Petersen had been in Denmark) I have seen none. At this time of the year they are usually quite numerous. The reason is probably that in the spring, according to the Greenlanders, an unusually large number of Snow Buntings died owing to the bad weather prevailing then, with heavy snowfalls. A few appeared later; October 3rd, one seen; 15th, small flocks, and one remained until December 12th.
1905. September 20th, many still seen; 23rd, small flocks seen; October 7th, although the country is now covered with a lot of snow, small flocks are seen every day; 31st, small flocks still seen about the houses; November 21st, the last seen.
1906. September 20th, a few seen; October 12th, still a few; 13th, a large flock flew past eastwards; 20th, three seen by the houses. Later in October and into November a few seen every day, the last on November 16th.
1907. September 10th, today, and the two foregoing days, I have seen

exceptional numbers round about — flocks of about 100; 13th, considerable flocks still seen.

1908. September 25th, fairly big flocks seen; October 14th, a number in the vicinity of the Station. A few were still seen in the latter half of October, although the country was covered with a deep layer of snow; the last seen November 5th.

1911. October 29th, a few seen, as also on November 6th; 13th, small flocks of 5—8. And still on November 28th a number were seen in small flocks of up to 10. The country is practically bare of snow. After December 4th none seen.

1912. September 20th, all small birds have now practically disappeared, although the country is quite bare of snow; October 9th, now, when the country is covered with snow, a single Snow Bunting is seen now and then; 20th, a flock of 11 seen today, the country is now about to be entirely covered with snow; 25th, many seen during the day, solitary birds and flocks of about 20. The last were seen in the last days of the month.

1913. September 29th, one or two still to be seen; November 15th, one, which during the past 14 days has stayed among my pigeons, has suddenly disappeared.

1914. October 15th, a lot still seen here in the immediate vicinity; 26th, still many; November 1st, one or two seen on a hunting trip; 9th, a number still to be seen, the last this year.

1923. September 30th, still seen in flocks; October 5th, small flocks seen every day; 8th, one or two seen, snow a foot deep; 12th, two seen; 28th, today and the foregoing days one has stayed about the houses; November 3rd, one again seen by the houses.

The Snow Bunting, which is so numerous in the Polar countries, breeds everywhere along the coasts of Greenland in large numbers and has been met with by all expeditions to the east coast. On the Denmark Expedition it was also seen frequently, even as far north as lat. 83°30 N.

E. Lehn Schiøler has drawn my attention to the fact that the Greenland Snow Bunting, including those he has received from the east coast, belong to a separate race which, by its peculiarities of plumage and by the large bill, differs from the typical form. It is probably reasonable to presume that the Snow Buntings living at Angmagsalik belong to this race; Brehm had already given those appearing in Greenland a special name.

LAPLAND BUNTING (*Calcarius lapponicus groenlandicus* Brehm.).
Laplandsværling, Sporeværling.

The Lapland Bunting is a fairly common breeding bird at Angmagsalik. As to its appearance we have the following data:

1900. May 13th	1908. May 26th
1901. — 20th	1912. — 2nd
1902. — 1st	1913. April 30th
1903. April 22th	1914. May 10th
1905. May 14th	1915. — 10th
1906. — 13th	1924. — 25th
1907. — 1st	

Leaving out one very early comer and the especially late data, it thus appears that the bird arrives in the first half of May; it remains in the autumn until the end of September; it has only once been seen later, October 13th, 1914.

It breeds commonly in West Greenland, and in East Greenland, outside of Angmagsalik, has only been met with once; has not been proved to breed elsewhere. On the Denmark Expedition it was only seen once.

As regards the Lapland Bunting, too, E. Lehn Schiøler has informed me that those in Greenland form a special race (also mentioned by Brehm), easily recognisable by the large bill. The skin sent from Angmagsalik clearly proves to belong to this large-billed race.

I have previously published the following works on bird life at Angmagsalik:

1) Ornithologiske Iagttagelser fra Angmagsalik af J. Petersen (Vidensk. Medd. fra nat. Forening 1898).
2) Ornithologiske Meddelelser fra Grønland. — Heri nogle Iagttagelser af Fugle fra Angmagsalik af Johan Petersen (Vidensk. Medd. fra nat. Forening 1899).
3) Fortsatte ornithologiske Meddelelser fra Grønland (Ibid. 1904).
4) Über Grönlands Vogelwelt (Journal für Ornithologie 1902).
5) Ornithologiske Iagttagelser fra Angmagsalik 1902—08. Af Johan Petersen. (Dansk orn. Forenings Tidsskrift Aarg. 3).
6) Nye Arter for Østgrønland (Ibid. Aarg. 4).
7) Die Avifauna Ostgrönlands (Bericht über den V. internationalen Ornithologen-Kongress, Berlin 1910).
8) Om nogle for Grønlands Øst- og Vestkyst nye og sjældne Arter. Af O. Helms og E. Lehn Schiøler (Dansk orn. Forenings Tidsskr. Aarg. 11).

In the following are named the most important works which have hitherto appeared on the birds of East Greenland, and of which several have been cited in the foregoing.

W. Scoresby jun.: Journal of a voyage to the northern Whale Fishery. Edinburgh 1823. — The voyage in 1822 went from about lat. 70 to about 75° N. A list of the birds observed is given.

D. Ch. Clavering: Journal of a voyage to Spitzbergen and the East coast of Greenland; in "Edinburgh New Philos. Journal", 1830. — The voyage in 1823 was from 73—75° N. A few birds are mentioned including swans.

W. A. Graah: Undersøgelsesrejse til Østkysten af Grønland, Kjøbenhavn 1832. — The journey (by boat) in 1828—31 was from Cape Farewell to about lat. 65° N., the winter being spent on the East coast. A list is given of the species which Graah himself had seen, and also of those which according to the Greenlanders were to be found on the East coast. A number of skins were brought home to the museum.

From the same journey there are, in Vahl's unpublished letters and diaries, many reports of the birds, especially on the most southerly part of the East coast.

C. Holbøll: Ornithologiske Bidrag til den grønlandske Fauna in "Naturh. Tidsskrift", IV. Vol., København, 1843. — Some of the species met with by Graah and Vahl are mentioned.

For more than half a century after Graah's journey only one report appeared on the birds on the East coast, viz. O. Finsch in the section "Vögel" mit Noten von A. Pansch in "Die zweite deutsche Nordpolarfahrt in den Jahren 1869 und 1870 unter Führing des Kapitän Koldewey". Leipzig 1873—74. — The journey was to the northern part of the East coast between lat. 73 and 77° N., spending the winter at Pendulum Island. In this is the first more detailed description of the birds of the East coast.

Meddelelser om Grønland IX and X. Den østgrønlandske Expedition udført i Aarene 1883—85 under Ledelse af G. Holm. København 1888. — Contains a report of a voyage in a boat along the coast and a description of it from Cape Farewell to Angmagsalik in about lat. 66° N., where Holm spent the winter. Holm names — particularly according to reports by the natives — the birds appearing at Angmagsalik and refers to their capture. (Vol. X, p. 54).

E. Bay: The section "Hvirveldyr" in Meddelelser om Grønland Vol. XIX. — The observations were made on the East Greenland Expedition, 1891—92, under the leadership of C. Ryder (Meddelelser

om Grønland XVII, XVIII and XIX). The coast was travelled from about lat. 70—73° N., Scoresby Sound and the country at Hold with Hope being especially explored, and a short stay at Angmagsalik; the winter was spent at Scoresby Sound. There are observations of birds in all three places, a number of skins were brought home. The knowledge of the avifauna of East Greenland was very considerably extended.

A. G. Nathorst: Två Somrar i norra Ishafvet. Stockholm 1900. — The coast from about lat. 70—76° N. was explored, especially Franz Josephs Fjord and the country around it. Numerous reports on birds are given here and there in the work.

G. Kolthoff: Til Spetsbergen og Nordöstra Grönland År 1900, Stockholm 1900. — Journey along the East coast between lat. 73 and 75° N., especially a sojourn on the Mackenzie Gulf on the Hold with Hope land. Contains much information about birds, some of them which were previously unknown or little known on the east coast.

G. Kolthoff: Bidrag til Kännedom om norra Polartrakternas Däggdjur och Fåglar i "Kungl. Svenska Vetenskaps-Akademiens Handlingar", Vol. 36, No. 9, Stockholm 1903. — Contains mostly the same observations of birds as the two foregoing works, but in rather more detail.

Meddelelser om Grønland XXVII: Carlsbergfondets Expedition til Østgrønland 1898—1900 under Ledelse af G. Amdrup. — The coast between Angmagsalik and Cape Dalton south of Scoresby Sound was travelled by boat; sojourn at Scoresby Sound and wintering at Angmagsalik. Also a voyage by ship from Scoresby Sound to Angmagsalik. In the description of the boat trips Amdrup now and again mentions birds. — From the same journey are observations by Deichmann from Scoresby Sound and from the voyage by ship between Scoresby Sound and Angmagsalik; they are published in Vol. XXIX of "Meddelelser om Grønland".

A. L. V. Manniche: The terrestrial mammals and birds of Northeast Greenland. (Meddelelser om Grønland XLV). — Contains detailed descriptions and biological observations of the birds met with on the Denmark Expedition. The book has numerous photographs and some coloured plates of birds. The same work is to be found in Danish in "Dansk orn. Foren. Tidsskr.", Bd. 5.

C. Madsen: Ornithologiske Iagttagelser fra Østgrønland. (Dansk orn. Foren. Tidsskr., Aarg. 19).

In some large works there are summaries of what was known of the birds in East Greenland when the books were written. The more important of these works are:

H. Winge: Grønlands Fugle (Meddelelser om Grønland XXI). — This contains all that was known of Greenland's birds up to 1897.

H. Schalow: Die Vögel der Arktis (Fauna arctica 1904). — This deals with all the birds in the north polar areas, including those in East Greenland. There is a comprehensive list of literature.

E. Lehn Schiøler: Danmarks Fugle, Vol. II, 1926. — In this volume, which will be published in the late summer of 1926, is a survey of all the birds in Greenland, including those in East Greenland, with our knowledge of them brought up to the most recent date.

The Angmagsalik District.

FORTEGNELSE

over de af

KOMMISSIONEN FOR
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UNDERSØGELSER I GRØNLAND

udgivne

MEDDELELSER OM GRØNLAND

udkommer som Regel 1 Gang aarlig og faas

portofrit tilsendt ved Henvendelse til Hovedkommissionæren

C. A. Reitzel, Boghandel,
Løvstræde 7,
København K.

MEDDELELSER OM GRØNLAND

UDGIVNE AF

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BIND LIX

MED 6 TAVLER

KØBENHAVN
C. A. REITZEL, BOGHANDEL
BIANCO LUNOS BOGTRYKKERI
1925

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BIND LIX

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1925

INDHOLD

I.

OM DET GAMLE ESKIMORAAB TIL DE FØRSTE SØFARENDE EFTER NORDBOTIDEN

AF

V. C. FREDERIKSEN
SOGNEPRÆST TIL THOREBY PAA LOLLAND
PRÆST I GRØNLAND 1902—1922

1924

I »Meddelelser om Grønland« IX, København 1889, Side 16—17, har nu afdøde Dr. Steenstrup i en meget interessant Note henledt Opmærksomheden paa det Raab, hvormed Eskimoerne oppe i Grønland i sin Tid, i det 16. og i det 17. Aarhundrede, modtog de Søfarende, der naaede op til deres Kyster. Efter Davis har det lydt som »Yliaoute«, efter Hall som »Yliout«, efter Baffin som »Elyot« og efter Danell som »Elevout«. Det optegnes altsaa lidt forskelligt i de forskellige Rejseberetninger, men ser dog alligevel ud til at være det samme Raab.

Dr. Steenstrup indrømmer kun lige, at der er en lille Mulighed for, at det er et rent eskimoisk Ord, der har været hørt, og tænker da paa »Inuit«, »Mennesker«, men hælder ellers til den Anskuelse, at det blot er en Efterligning af Matrosernes Opsang eller af deres Tilraab, en Genganger paa Eskimoisk af det europæiske Sømandshallo!

Mod »Inuit« taler dog, at Raabet ikke efter nogen af Optegnelserne har n i første eller anden Stavelse, og mod »Hallo« eller en blot Efterligning af Matrosernes Opsang, at Endelsen ut (ute, ot), der er eskimoisk nok, tyder paa, at det drejer sig om et Ord, der i Forvejen er kendt og brugt af de raabende selv. Eskimologen W. Thalbitzer, nu Docent ved Københavns Universitet og Medlem af det kgl. danske Videnskabernes Selskab, der behandler Spørgsmaalet paa to Steder i »Meddelelser om Grønland« XXXIX, København 1914, slutter sig da heller ikke til Steenstrup, men gaar helt sine egne Veje.

Side 470 mener Thalbitzer nemlig, at Raabet svarer til det vestgrønlandske Ord for »Slynge«, af ham skrevet »iʟʟoot«, af Kleinschmidt i »Den grønlandske Ordbog«, København 1871, Side 77 »igdlût« (g = Bagtungeglidelyd, dl = pustet l, û = langt og mere aabent u), og Side 677, hvor han med Opgivelse af sit første Forslag fremsætter et nyt, tænker han paa »ila« som Begyndelsesordet og oversætter derefter hele Raabet ved »Vi er Venner«, idet han i en Note under Texten henviser til, at »ilanga« efter Boas hos »Ukusiksalik«-Eskimoerne bruges som Hilsen og betyder »min Ven«.

Begge disse Forslag rammes imidlertid i lige Grad af den Indvending,

at de i Virkeligheden ser bort fra, at alle Optegnelserne af Raabet er enige om en i (y, e)-Lyd efter l. Ogsaa med Hensyn til Meningen volder de hver for sig Vanskelighed. Med »igdlût« — som Thalbitzer altsaa ogsaa selv har opgivet — er der saaledes det i Vejen, at der ikke er noget om, at Eskimoerne brugte Slynge lige hver eneste Gang, de brugte Raabet, og mod »ila«, at dette i Forbindelse med Udsagnsordet for »vi er« = »— uvugut« betyder »vi er i Følge med den eller de andre her, vi er med her« og ikke »vi er Venner« d. e. som Hilsen »vi er venligsindede mod Eder«, en Betydning, som heller ikke stemmer med den Kendsgerning, at der efter Beretningerne dog var Lejligheder, hvor Eskimoerne brugte Raabet samtidig med, at de netop var i høj Grad krigeriske.

Det er derfor nødvendigt at prøve en ny Vej, som bedre kan føre til Maalet. Et Udgangspunkt har man da i det særlige Træk, som nok hverken Steenstrup eller Thalbitzer har undladt at bemærke, men som de dog ikke har benyttet, nemlig det, at Eskimoerne, naar de udstødte deres Raab, ogsaa pegede op mod Solen. Europæerne opfattede dem derfor som Soldyrkere, og i Olearius'es Liste over Ord fra Danell's Grønlændere oversættes »Iliout« og »Ilioun«, aabenbart det samme Ord som det her omhandlede Raab, ligefrem ved »Solen«.

En vejledende Oplysning af afgørende Betydning foreligger hos Hans Egede. I sin egen »Relation«, der er udkommen i København 1738, fortæller han nemlig under 21. August 1722 om en Grønlænder, der til Straf for en begaaet Forseelse blev holdt tilbage i Arrest den Dag, og som saa »blev derover meget bange, begyndte at ville hexe, mumlede, og brugte pudseerlige Gebærder; talede op til Himmelen, og, iblant andet vi ikke kunde forstaae, nævnte Maanen, ligesom han vilde kalde nogen til Hielp der fra. Undertiden lydde han til, som han skulde høre nogen komme; bad og os høre og give agt paa, der skulde ret nu komme dem, som vel skulle frelse hannem fra os.«

Det vil altsaa sige, at kunde Eskimoerne paa Hans Egedes Tid tro, at Himmellegemerne var deres Forbundsfæller, som de kunde true de mægtige Fremmede med, saa kunde Eskimoerne paa Danell's Tid, Eskimoerne paa Baffin's og Hall's Tid og Eskimoerne paa Davis'es Tid ogsaa, og man forstaar, hvorfor de har peget op mod Solen, mod Himlen og raabt »ilivut«, der netop betyder — »vore Forbundsfæller!«

Gentaget af Søfolkene har dette Raab paa den anden Side kunnet virke beroligende tilbage paa Eskimoerne, og heri ligger da Grunden til Davis'es Misforstaaelse, at det skulde betyde »jeg mener ikke noget ondt«; hvor rigeligt Davis i det hele taget kunde opfatte forkert, fremgaar for øvrigt kun altfor tydeligt ogsaa af andre Ord i hans Ordliste. Mere Mening er der saa i Olearius'es Oversættelse, da den i det mindste indeholder noget af en rigtig Kommentar, fordi Solen jo dog hørte med til Himmelaanderne, som Eskimoerne regnede for deres »Forbundsfæller«.

»ilivut« — eller med stemt Endekonsonant som i ældre Tids Kvindeudtale (jfr. Fabricius'es Grønl. Gramm., 2. Opl. København 1801, Side 10) »ilivun« — er dannet paa sædvanlig Maade ved at føje Endelsen »—vut«, »vore« (jfr. Hans Egedes »Perlustration«, København 1741, Side 97) til den vokaludlydende Rodstamme af »ilik«, et Ord, som bruges den Dag i Dag, selv om det just ikke hører til de aller almindeligste. Det er optegnet af Kleinschmidt i hans grønlandske Ordbog Side 85, i Kjer og Rasmussen's Dansk-grønl. Ordb., København 1893, Side 165 og som forekommende ogsaa i Labrador og Alaska af Rink i hans eskimoiske Ordliste i »Medd. om Grønl.« XI, København 1887, Side 101.

»Yota« i Purchas'es Udgave af Hall er kendetegnet som en Lemlæstelse derved, af Hall's egen Manuskriptform er »Ylivut«, og a i Davis'es »Yliaoute« er i det højeste at regne for en Efterklang af de raabendes lange Udtale af (det midterste) i, ligesom e i Slutningen kun er at opfatte som en Vokalisering af Aspirationen ved den stærke Udtale af t.

Den gamle Eskimotro om Himmellegemerne som Aander, der baade kan gavne og skade, genfandt nuv. Kommandør Holm hos Angmagssalik'erne paa Grønlands Østkyst, da han overvintrede hos dem 1884—1885, jvf. »Meddelelser om Grønland« X, København 1888, Side 114 ff. For øvrigt meddeler Hans Egede i sin »Perlustration« Side 123, at Solen og Maanen, der af Eskimoerne opfattedes henholdsvis som Kvinde og Mand, begge hader den andens Køn, Solen altsaa Mandfolk — i gamle Dage maa der da have været noget særlig virkningsfuldt i at pege paa Solen til at skræmme de fremmede Søfolk med, og saa var der jo endda desuden den mægtige Maane!

Til Slut ønsker jeg at udtale en hjærtelig Tak til Docent W. Thalbitzer, der trods vor Uoverensstemmelse i Anskuelser alligevel med stor Fordomsfrihed og Venlighed har opmuntret mig til at fuldføre og fremlægge denne Undersøgelse.

II.

OM BETYDNINGEN AF »ETAH«

AF

V. C. FREDERIKSEN
SOGNEPRÆST TIL THOREBY PAA LOLLAND
PRÆST I GRØNLAND 1902—1922

1924

Til de Stednavne i Grønland, hvis Betydning endnu ikke er bestemt, hører »Etah«. Stavemaaden er engelsk-amerikansk; efter Thalbitzer's vilde det være »eeta«, jvf. hans »Eskimo«, Washington 1911, pag. 976, og efter Kleinschmidt îta (î = langt og mere aabent i).

Mere end een Gang har jeg drøftet Spørgsmaalet med Knud Rasmussen, som dog ikke mente at kunne yde Hjælp. Freuchen, som jeg ogsaa har talt med derom, henledte Tanken paa »itsa«, »Inderskindet i et Telt eller Skindet, som ligger ovenpaa et Hus for Regn« —men selv om dette i nordgrønlandsk Udtale kan blive til »itta«, saa er det alligevel paa Grund af sit korte i og med det følgende t i fast Tilslutning altfor forskelligt i lydlig Henseende til at kunne have noget at gøre med Etah (eeta, îta).

I 1918 havde jeg Lejlighed til at drøfte Spørgsmaalet med Avoortungiaq, Knud Rasmussen's nu afdøde Kap Yorker-Fælle Ajako's Hustru. Jeg spurgte hende, om det ikke kunde være »iisaq«, »Fiskesnørens nederste, stive Del (imellem Krogen og Sænkestenen, i Regelen gjort af Ben eller Hvalbarde, og som navnlig bruges paa Hellefiske- og Torskeliner)«, jvf. Kleinschmidt's grønlandske Ordbog pag. 117: îsaĸ. Hun indrømmede, at der med t hos Kap York'erne for s hos de sydligere Grønlændere ikke var noget i Vejen med det lydlige, men med det saglige det, at Kap York'erne ikke kender til Fiskeri og derfor heller ikke til Fiskeredskaber. Hertil maa jeg dog bemærke, dels at en saadan Paastand kan være for absolut, dels at Talen blot behøver at være om Gravgods fra de første Eskimoers Tid, der jo er kommen andetsteds fra; Gravgods har vitterligt tit givet Anledning til at opfinde Stednavne i Grønland, og jeg har derfor endnu ikke sluppet denne Hypotese helt.

Der er dog en ikke ringe Mulighed for, at man maa foretrække en anden. Under mit Ophold ved Prøven i Upernivik's Distrikt nogle Dage i Sept. 1922 henledte nemlig den grønlandske Præst Jens Olsen min Opmærksomhed paa Ordet »iitagpoq (îtagpoĸ)«, »kaster op af Overmættelse«, et Ord, der nok ikke er optegnet af Kleinschmidt, men dog bruges rundt om i Nordgrønland, saaledes i Ũmánaĸ's (eller Uummannaq's) Distrikt af Ældre, efter hvad Fru Distriktslæge Bertelsen, f. Fleischer,

nu har meddelt mig; muligvis er det en Slags Forkortning af ingashagpoq (Kleinschmidt's Ordbog pag. 104: »ingassagpoĸ«), der især betyder: »har spist for meget, saa han faar ondt af det«.

Da Navneord paa Eskimoisk tit er dannet af Roden i Udsagnsord, er der intet i Vejen for sprogligt at tænke sig îta (iita) dannet af îta (gpoq), og hvad det saglige angaar, da har Knud Rasmussen i »Meddelelser om Grønland«, Bd. 61, pag. 536, den Bemærkning om Etah, at det er »et stort kvidrende Fuglefjæld for de smaa livlige Søkonger«. Maaske betyder da Etah, »det Sted, hvor Fuglene af Overmættelse kaster op«. Pastor Jens Olsen mente rigtignok selv, at det maatte referere sig til, at Stedet i gamle Dage havde været et særlig godt Madsted for Mennesker; jeg tror dog, at Navnet bedst refererer sig til Fuglefjældet — da Pastor Jens Olsen endnu ikke den Gang havde været ved Kap York, grunder hans Mening sig heller ikke paa Selvsyn eller Kendskab til Tradition.

Endnu skal jeg tilføje, at den tidligere grønlandske Præst ved Kap York, Gustav Olsen, hvem jeg ogsaa mere end een Gang har talt med om Betydningen af Ordet Etah, ikke har haft nogen Oplysning at meddele til Spørgsmaalest Besvarelse.

Efterskrift.

Ved at gennemlæse »Beretninger og Kundgørelser vedrørende Styrelsen af Grønland« 1923, Nr. 3, er jeg paa Side 58 bleven opmærksom paa, at det almindelige Ord for »Fiskekroge«, qarsorsat (i Kleinschmidt's Retskrivning ĸarsorsat, jvf. Ordbogen Side 133—134), et Ord, der efter Rink i Medd. om Grønl. XI Side 109 ogsaa kendes vest for Davis Strædet, forekommer som Stednavn i Julianehaabs Distrikt, jvf. ogsaa Medd. om Grønland LXI Side 415 og 489, ligesom Enkeltalsformen qarsorsaq forekommer som Stednavn i Egnen ved Nordre Strømfjord, jvf. Medd. om Grønl. LX Side 2 og 5. At en Lokalitet er bleven opkaldt efter foreliggende Vidnesbyrd om, at andre har været før paa Stedet, er der for øvrigt andre Exempler paa; saaledes betyder Agto, Navnet paa den kendte Ø mellem Egedesminde og Holstensborg — maaske samme Navn som Attu, den vestligste af Aleutøerne mellem Alaska og Kamtshatka — simpelthen blot »benyttet Teltplads« (i den udvidede Form agtuko bruges det i denne Betydning den Dag i Dag i Holstensborg — Sukkertoppens Distrikt og kommer egentlig af ato-rpâ, »bruger det«).

Alt dette tyder paa, at den første Forklaring, som jeg ovenfor har fremsat paa Kap Yorker-Stednavnet Etah, er den rigtige.

III.

SMALL ADDITIONS TO THE VINLAND PROBLEM

IN CONSEQUENCE OF PROFESSOR H. P. STEENSBY'S "NORSEMEN'S ROUTE FROM GREENLAND TO WINELAND"

BY

GUSTAV HOLM

1924

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INTRODUCTION

"What is there to justify a monument to Leif Ericsson in Boston?" An address began thus written in 1887 by Eben Norton Horsford[1]) in consequence of a statue to Leif being unveiled in Boston. Horsford's answer was in keeping with what C. C. Rafn had explained in "Antiquitates Americanae" and in "Grønlands historiske Mindesmærker": "Through Leif and Bjarni the American continent was discovered by Northmen, and Leif was the first European to set foot on its shores, — the first to tread the soil of Massachusetts".

Gustav Storm's meritorious paper "Studier over Vinlandsrejserne"[2]) was already published in 1888, which relying on Eric the Red's Saga, differed to Rafn's interpretation of the primary sources, and pointed out definitely that Vinland was not Massachusetts and Rhode Island, but Nova Scotia. Shortly after followed Arthur Middleton Reeves' merited work, "The Finding of Wineland the Good"[3]), containing all the oldest accounts treating on the Vinland voyages. Reeves also differed from Rafn.

Many papers have been written later, where one is rightly entitled to assume the position of the Northmen's Vinland; and many different opinions are expressed in these papers. Leif's Vinland, however, is generally placed between Passamaquoddy Bay within Nova Scotia and Hudson River within Long Island. Even authors, who have founded their works on the same Saga views, and have used similar methods have come to perfectly different results; e. g. William Hovgaard[4]) and Andrew Fossum[5]). It is Hovgaard's opinion that Leif reached the neighbourhood of Cape Cod, whilst Fossum believes that he came to the St. Lawrence River near Quebec; whilst they both assume that Karlsefni only reached Newfoundland's east coast.

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[1]) Discovery of America by Northmen. Boston and New York. 1888.

[2]) Aarbøger for nordisk Oldkyndighed og Historie. København. 1887.

[3]) London. 1890.

[4]) The voyages of the Norsemen to America. New York. 1915.

[5]) The Norse discovery of America. Minneapolis. Minn. 1918.

In Fridtjof Nansen's great work: "In Northern Mists"[1]) his opinion is, that it is possible that the Northmen had knowledge of America, but he has tried to shake the faith in the Saga tales of the Vinland voyages, and interpretated them as a mixture of legends and myths. Finnur Jónsson[2]), William Babcock[3]), Hovgaard and Gathorne-Hardy[4]) have strongly opposed this theory.

Many authors who have dealt with the Vinland voyages are of the opinion that it is impossible to state the position of the places mentioned in the Sagas, unless decisive evidence of these places is to be found, which is more than improbable. Everything that one has thought could be a clue to the Northmen has been carefully examined, and one has come to the result that nothing is to be found which could remind us of a visit of the Northmen[5]).

Most people can to a certainty agree to what the President for Société des Américanistes de Paris, H. Vignaud says about the visits of the Northmen to America, namely: "Ils ont certainement découvert et visité à plusieurs reprises une contrée que les Sagas nomment Wineland, mais dont il est impossible aujourd'hui de déterminer la situation"[6]).

The last Danish paper written on this subject was the one written by the unfortunately so early deceased, Professor H. P. Steensby: "Norsemen's route from Greenland to Wineland"[7]). He places both Leif's Vinland and the country visited by Karlsefni at the tract about Montmagny (St. Thomas) in the neighbourhood of Quebec on the south bank of the St. Lawrence River. His method of settling the place is very attractive, namely in following, very closely, Karlsefni's accounts of his voyage, as he takes it for granted that Karlsefni followed the coast-line as far as it is possible, and his opinion is that in that manner Karlsefni reaches Leif's Vinland.

If this or Fossum's identification was correct it would be rather unnatural to raise a monument in Boston in memory of Leif's landing on America's mainland.

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[1]) London. 1911.

[2]) Erik den Rødes Saga og Vinland. Historisk Tidsskrift. Kristiania. 1911.

[3]) Early Norse visits to North America. Smiths. Misc. Coll. Washington. 1913.

[4]) The Norse Discoverers of America. Oxford. 1921.

[5]) Hovgaard (op. cit. p. 115) however differs a little in his opinion, in writing about some ruins found by Horsford in Massachusetts and presumed by him to date from the Norse time; he says that "the researches which some years ago were undertaken on the spot did not bring to light any positive evidence to substantiate this theory, but, on the other hand, there appears to be nothing absolute to disprove it".

[6]) Langlois: "La découverte de l'Amérique par les Normands au X^{e} siècle" (La Géographie. Paris. 1922).

[7]) "Meddelelser om Grønland", Vol. LVI. København. 1917.

Before I proceed to speak of Steensby's work and the critisism brought forward by Gathorne-Hardy, Alph. Gagnon[1]), Babcock[2]) and several others, I will mention the primary sources and give a short sketch of the Sagas.

The primary sources.

ADAM OF BREMEN ABOUT VINLAND. — The oldest account, we have, about Vinland dates from Adam of Bremen, who, during his stay at the Danish court about 1070, gathered information especially from the king, Svend Estridsson, about the geography of the northern countries. The tradition of Vinland's discovery and the voyages undertaken there, was at that time still of interest. Adam of Bremen's short account is older than the accounts from Iceland and is perfectly consistent with them, as one will see below. He writes about Vinland[3]):

"Moreover he spoke of an island in that ocean discovered by many, which is called Vinland, for the reason that vines grow wild there, which yield the best of wine. Moreover that grain unsown grows there abundantly, is not a fabulous fancy, but, from the accounts of the Danes, we know to be a fact".

FRAGMENT OF AN ANCIENT GEOGRAPHY; AM. No. 194. — The oldest Icelandic information concerning Vinland, dates from the beginning of the 12th century and is to be found in Ari Frode's Íslendingabók[4]). Ari obtained it from his father's brother, Thorkell Gellison, at Helgafell, who lived in the latter half of the 11th century. The most explicit account is to be found in a short description of the world in the Arne-Magnæan collection of manuscripts in the University of Copenhagen: No. 194, 8vo [5]) which is written at the end of the 14th century, and a fragment of it will be given here:

"South of Greenland is Helluland, then is Markland; thence it is not far to Vinland the Good, which some men suppose extends from Africa, and, if this be so, then there is an open sea flowing in between Vinland and Markland. It is said, that Thorfinn Karlsefni hewed a "house-neat-timber" (húsa-snotro tré) and then went to seek Vinland

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[1]) La question du Vinland (Bulletin de la Société de Géographie de Quebec. 1918).

[2]) Recent history and present Status of the Vinland Problem. (The Geographical Review. Vol. XI. New York. 1921).

[3]) Reeves: "The Finding of Wineland the Good". London, 1890. p. 92.

[4]) I am indebted to Professor Finnur Jónsson for several valuable suggestions.

[5]) Reeves, op. cit. pp. 15, 16.
Kr. Kålund: Alfræði íslendzk. København. 1908. p. 12.

the Good, and came there where they supposed this land was, but they did not acquire any knowledge of it, nor obtained any of its products (ok kæmi þar er þeir ætluðu þat land, ok náðu eigi ath kanna ok eingum landz-kostum). Leif the Lucky first found Vinland, and he then found merchants in evil plight at sea, and restored them to life by God's mercy; and he introduced Christianity into Greenland, which waxed there so, that an episcopal seat was established there, at the place called Gardar".

This account agrees to former very concise reports of Vinland and states that Leif found the country and that Thorfinn Karlsefni, who started in search of it, reached a country which he believed to be Vinland, but did not succeed in exploring it. It seems to appear from this, as Storm says, that Karlsefni's voyage is indicated as the only voyage of exploration which starts with the aim of reaching Vinland, in consequence of this country being accidently discovered by Leif.

EIRÍKS SAGA RAUÐA AND GRÆNLENDINGA ÞÁTTR. — The saga tales about the Vinland voyages are to be found, as is well-known, in two different accounts, the one of which is called "Eiríks Saga Rauða", and the other "Grænlendinga þáttr", which is to be found in Flateyjarbók.

Gustav Storm, and later Finnur Jónsson[1]) have come to the result that the contents of the Flateyjarbók's Grænlendinga þáttr ought not to be used without criticism. Finnur Jónsson writes[2]) that "the þáttr is a spontaneous production of obscure, confused and disconnected traditional associations (or fragments), not without being influenced by the knowledge of Eric's saga itself".

It is related in the Flateyjarbók's "þáttr Eiríks rauða", that Bjarni Herjulfsson, on his voyage from Iceland to Greenland about 986, was blown far to the west and first reaches a land "without mountains and wooded, and had low hills". They then left the land on their port side and after two days sailing they came to a "flat land covered with woods", and later still, after three days sailing they came to a "high land covered with mountains and glaciers".

They turned the ship's stern towards this land and sailed for four days over the sea before a rising south-west wind, and in that manner reached Greenland, without having set foot on the new countries. Storm and Jónsson both express themselves as sceptically about this tale of Bjarni's discovery of America as about Grænlendinga þáttr, and are of the opinion that the voyage never took place.

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[1]) Opdagelsen af og Rejserne til Vinland (Aarbøger for nordisk Oldkyndighed og Historie. København. 1915).

[2]) op cit. p. 220.

Finnur Jónsson finally says[1]) "that the Grænlendiga þáttr is of such a kind that it would be quite hopeless to search the discovered countries and places, according to it, or by its assistance. It is quite another question with regard to the saga of Eric. If there exists at all anything in keeping with this detailed description, one would think that it would be possible to find them".

After the definite declarations of these authorities I will only abide by "Eric the Red's Saga". It is to be found in the Arna-Magnæan (AM.) collection of manuscripts, in two Icelandic leading versions; namely No. 544 and 557, 4to. They are of different dates. The oldest and best manuscript, No. 544, is generally called Hauksbók and is written in the beginning of the 14th century. The other, No. 557, is written about a century later, but probably derives from the same original manuscript as Hauksbók[2]). A paper manuscript, which is called *M*[3]) in Grønl. hist. Mindesm., belongs to the leading version AM. 557. Rafn writes about this that "it contains several remarkable supplements, and excellent reading, partly of such a description that the others' faults could with difficulty be rectified without its aid". As, meanwhile Finnur Jónsson's opinion is that it is of no signification, I have only referred to it occasionally in the notes.

The texts in the leading versions resemble each other so much that, as already mentioned, they must originate from a common source, which according to Finnur Jónsson is probably written about the year 1200, but exists no longer. In Reeves' meritorious work facsimiles of the manuscripts AM. 544 and 557 are to be found, together with Icelandic texts, which are revised by Professor Valtýr Guðmundsson.

Like the most of the earlier authors, Professor Steensby has used Hauksbók (AM. 544) with only a few references to AM. 557. As far as Karlsefni's voyage is concerned, there are in AM. 557 several elucidatory additions and remarks to be found, which further the comprehension of the Saga, and which are not mentioned in Hauksbók. On the other hand the remarks in Hauksbók which are not to be found in AM. 557 are of much less importance. I therefore think it best, in the subsequent paper, to use the text from AM. 557, which, as mentioned, is to be found printed in Reeves' book, and compiled by AM. 544 in Storm's "Eirík Saga Rauða".

As I do not know whether a complete translation of this version

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[1]) ibid. p. 221.

[2]) Grønl. hist. Mindesm. I, p. 349. — Storm op. cit. p. 306. — Finnur Jónsson: Hauksbók 1892—96. p. LXXXIII.

[3]) According to Gustav Storm's: Eirík Saga Rauða (Copenhagen 1891) this manuscript is now to be found in the British Museum's library. No. 11, 126. This copy has been taken by Oddr Jónsson 1768.

from Icelandic is to be found, I have generally used Reeves' translation; but in other places I have benefited by the translation of "Grønl. hist. Mindesm." and by Hovgaard's and Gathorne-Hardy's books, already mentioned. I have taken the translation of Thorhall the Hunter's two verses (p. 23) from Daniel Bruun's book: "The Icelandic Colonisation of Greenland"[1]). The Icelandic translation is here undertaken by Finnur Jónsson from Hauksbók but the difference in text of the verses between Hauksbók and AM. 557 is very slight. According to Reeves and Storm the verses are older than the saga text.

The ethnographic and botanic material has been so often discussed, and in such a thorough and well-informed manner that I cannot add anything new to it and therefore will completely omit touching on this subject.

There, where there in my opinion was reason to do so, I have in notes below the text, given the deviating text in Hauksbók, and as already mentioned, in a couple of places in the paper-manuscript *M.*

FRAGMENTS OF THE SAGA OF ERIC THE RED. AM. 557.

". . . . Leif put to sea (from Norway) when his ship was ready for the voyage. For a long time he was tossed about upon the ocean, and came upon lands of which he had previously no knowledge. There were self-sown wheat-fields and vines growing there. There were also those trees which are called "mösur", and of all these they took specimens[2]) . . . .".

". . . . At this time there began to be much talk about a voyage of exploration to that country which Life had discovered. The leader of this expedition was Thorstein Ericsson, who was a good man and an intelligent, and blessed with many friends. Eric was likewise invited to join them, for the men believed that his luck and foresight would be of great furtherance. [He was slow in deciding, but did not say nay, when his friends besought him to go[3]). They thereupon equipped that ship in which Thorbiörn had come out, and twenty men were selected for the expedition. They took little cargo with them, mostly weapons and provisions. On that morning when Eric set out from his home . . . . he fell from his horse and broke his ribs and discolated his shoulder . . . .

Thereafter they sailed cheerily out of Ericsfjord in high spirits over their plan. They were long tossed about upon the ocean, and could not lay the course they wished. They came in sight of Iceland, and

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[1]) Medd. om Grønl. vol. LVII.

[2]) Hauksbók adds: "Some of the timbers were so large, that they were used in building. Leif found men upon a wreck, and took them home with him".

[3]) From [the text is supplied from Hauksbók.

then they saw birds from Ireland. Their ship was driven hither and thither over the sea. In the autumn they turned back, worn out by toil, and exposure to the elements, and exhausted by their labours. They arrived at Ericsfjord [at the very beginning of winter. Then said Eric[1]): "More cheerful were ye[2]) in the summer, when ye put out of the firth, but ye still live, and it might have been much worse . . ."

"[Karlsefni and Snorri determined to go in search of Vinland, and this gave rise to much talk. And the end of the matter was[3]), that Karlsefni and Snorri equipped their ship and determined to go in search of Vinland during the summer. Bjarni and Thorhall joined the expedition with their ship, and the men who had accompanied them.

There was a man named Thorvald; he was a relative by marriage of Eric the Red[4]). Thorhall was called the Hunter (veiðimaðr); he had long lived with Eric, engaging in fishing and hunting expeditions during the summer, and had many things under his charge. Thorhall was a man of great stature, swart and giant-like; he was rather stricken with years, overbearing in manner, taciturn, and usually a man of few words, underhanded in his dealings, and yet given to offensive language, and always ready to stir up evil; he had concerned himself little with the true faith after its introduction into Greenland. Thorhall was not very popular, but Eric had long been accustomed to seek his advice. He was on the same ship with Thorvald and his companions, because he had extensive knowledge of the uninhabited regions (því at honum var víða kunnigt í óbygðum). They had that ship which Thorbiörn had brought out. They joined Karlsefni and his companions in their expedition, and they were mostly Greenland men on board. There were on their ships forty men off the second hundred (i. e. one hundred and sixty men).

Then they sailed away [to Vestri Bygð[5]), and[6]) to Bjarneyja (the Bear Isles). [They sailed away beyond Bjarneyja, with northerly winds. They were out two "dægr"[7]); then they discovered land, and rowed thither in boats, and explored the country, and found there many flat stones

[1]) From [the text is supplied from Hauksbók.

[2]) Hauksbók has "we" (vér) instead of "ye" (þér) throughout.

[3]) From [Hauksbók has: "Beginning of the Vinland Voyage (Hófsk Vínlandsferð). — About this time there began to be much talk at Brattahlid, to the effect that Vinland the Good should be explored, for, it was said, that country must be possessed of many goodly qualities. And so it came to pass"

[4]) In Hauksbók and elsewhere in AM. 557 Thorvald is mentioned as a son of Eric the Red.

[5]) From [*M* has: "from the land to vestari úbygðir"

[6]) Hauksbók and *M* adds: "þaðan" (thence)

[7]) From [Hauksbók has: "Thence they bore away southward two "dægr".

(hellur), [so large, that two men could well spurn soles upon them (i. e. lie at full length upon them, sole to sole)[1]; there were many Arctic foxes there. They gave a name to the country, and called it Helluland.

Then they sailed with northerly winds two days (dægr)[2], and land then lay before them, and upon it was a great wood and many wild beasts; an island lay off the land to the south-east, and there they found a bear, and they called this Bjarney (Bear Island), while the land where the wood was they called Markland (Forest-land).

[Then when two days had elapsed, they sighted (sjá) land, and they sailed off this land; there was a cape to which they came[3]. They beat along this coast, having the land upon the starboard side. This was a bleak coast (öræfi), with long and sandy shores. They went ashore in boats, and found the keel of a ship, so they called the place Kjalarness (Keelness); they likewise gave a name to the strands, and called them Furdustrands, because they were long to sail past.

Then the country became fjordcut (vágskorit), and they steered their ships into the bays[4] . . . . Now when they had sailed past Furdustrands, they put the Scotts[5] ashore, and directed them to run to the southward, and investigate the nature of the country, and return again before the end of the third day . . . . Karlsefni and his companions cast anchor, and lay there for this period; and when three days had passed, they ran down from the land, and one of them had in the hand a grape-cluster[6], and the other wheat self-sown. They told Karlsefni that they thought that they had found that the resources of the land were good. They received them into their ship, and went their ways, till the country was fjordcut.

They took the ships into the fjord. There was an island outside, about which there were strong currents, wherefore they called it Straumsey. There were so many birds on the island, that it was scaresly possible to step between the eggs. [They sailed into the fjord (þeir heldu inn með firðinum)[7], and called it Straumsfjord, and carried their cargoes ashore from the ships, and established themselves there. They had brought with them all kinds of live-stock. They explored the nature of the land. There were mountains there, and the country round about was fair to look upon. They did nought but explore the country. [There was tall grass there (þar váru grös mikil)[7].

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[1] From [Hauksbók has: "and many of these were twelve ells wide".

[2] Hauksbók adds: "and bore away from the south toward the south-east".

[3] From [Haulsbók has: "Thence they coasted south for a long while, and came to a cape".

[4] Haulsbók has: "into a bay".

[5] As noticed by Finnur Jónsson the episode of the Scotts is obviously inserted from another source.

[6] AM. 557 has "vinker", doubtless a clericel error for "vinber", grapes.

[7] From [omitted in Hauksbók.

They remained there during the winter, [and they had a severe winter (ok görðisk vetr mikill)[1]), for which they had not prepared (en ekki fyrir unnit), and they grew short of food, and the fishing fell off. [Then they went out to the island, in the hope that something might be forthcoming in the way of fishing or flotsam. But there was little food to be obtained on it, although their live-stock fared well there[1]) . . . . Soon afterwords there came a whale, and they went to it and cut it up, but no one knew what sort of whale it was. Karlsefni had much knowledge of whales, but he did not know this one. The cooks boiled this whale, and they ate of it, but were all ill from it . . . .[2]) They were then able to row out to fish, and they had no longer any lack of the necessities of life. In the spring they went into Straumsfjord, and obtained provisions from both regions, hunting on the mainland, gathering eggs[3]), and fishing in the sea.

Now they consulted about their expedition, and came to an agreement. Thorhall the Hunter wished to go northward along Furdustrands [and past Kjalarness[4]) in order to find Vinland (ok leita svá Vínlands); while Karlsefni wished to proceed southward along the coast [and east of the land, believing that country to be greater, which is farther to the southward, and it seemed to him more advisable to explore in both directions[4]). Thorhall prepared for his voyage out by the islands[5]), having only nine men in his party, for all of the remainder of the company went with Karlsefni. And one day when Thorhall was carrying water aboard his ship, and was drinking, he recited this ditty:

"The men said, when I came here,
that I should get the best drink;
I can justly blame the country for all;
I'll be obliged to swing the (water) pail,
there came not a drop of wine to my lips.
On the contrary I must
creep down to the spring".

[Then they put to sea, and Karlsefni accompanied them out off the island[1]). Before they hoisted sail, Thorhall recited this ditty:

"Let us travel back
where our countrymen are,
let us let the ship plough
the broad sea,
whilst the unwearied warriors
who praise the country here,
settle on Furdustrand
and cook their whale".

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[1]) From [omitted in Hausbók.
[2]) Hauksbók has: "The weather then improved, and"
[3]) Hauksbók adds: "on the island"
[4]) From [omitted in Hauksbók.
[5]) Hauksbók has: "island".

Then they parted and sailed north past Furdustrands and Kjalarness, intending to beat along the coast to the westward, but they were met with a storm and driven ashore in Ireland, where they were much ill-treated and thrown into slavery. There Thorhall lost his life[1]).

Karlsefni, together with Snorri and Bjarni and their people, went southward along the coast. They sailed for a long time, till they came to a river, which flowed down from the land into a lake, and then into the sea. There were many isles (eyjar)[2]) before the mouth of the river, and the river could not be entered except at high tide. Karlsefni and his men sailed into the estuary and called the place Hóp. They found there self-sown wheat-fields on the low land, but vines where the ground was high. Every brook there was full of fish. They dug pits on the beach at the edge for the high tide, and when the tide fell there were halibuts in the pits. There were great numbers of animals of all kinds in the woods. They remained there half a month (þeir váru þar hálfan mánuð), and enjoyed themselves, without noticing anything further. They had their live-stock with them.

Now one morning early, when they looked about them, they saw nine skin-boats, and staves were brandished from the boats, with a noise like the wind whistling in stacks of straw, and the staves were swung with the sun. Then Karlsefni said: "What is the meaning of this?" Snorri answered him: "Perhaps this is a sign of peace, so let us take a white shield and display it". And thus they did. Thereupon the strangers rowed toward them, marvelling at what they saw and went on shore. They were small[3]) men, and ill-looking, and the hair of their heads was rough (illt). The had large eyes and broad cheeks. They stayed there for a time, wondering at the people they saw before them, and then they rowed away southward around the point.

Karlsefni and his men had taken up their abodes (bygdir)[4]) above the lake, some dwellings were near the mainland, and some near the lake. Now they remained there that winter. No snow whatever came, and all of their live-stock remained in the open, finding their own pasture (þar kom alls[5]) inga snjár, ok allr fénaðr gekk þar úti sjálfala). At the beginning of spring, they observed, early one morning, a number of skin-canoes, rowing from the south past the cape, so numerous, that it looked as if coals had been strewn at the mouth of the bay; and on every boat staves were waved . . . .

It now seemed clear, that though this country had good resources, their life would be one of constant dread and turmoil for those who

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[1]) Hauksbók adds: "according to the reports of traders".

[2]) Hauksbók has: "eyrar" = sand-spits or shoals.

[3]) Hauksbók has: "svartir" instead of "smáir".

[4]) Hauksbók has: "budir".

[5]) "alls" omitted in Hauksbók.

dwelt there before. They therefore determined to return to their own country, and prepared to depart. They sailed to the northward off the coast, and found five sleeping Skrælings, clad in coats of skin . . . . They afterwards found a cape, upon which there was a great number of animals, and this cape looked as if it were one cake of dung, by reason of the animals which lay there during the winter[1]). They now arrived again at Straumsfjord, where they found great abundance of all those things of which they stood in need.

Some men say (Er þat sumra manna sögn), that Bjarni and Freydis remained behind here with a hundred men, and went no further; while Karlsefni and Snorri proceeded to the southward with forty men, and stayed at Hóp[2]) barely two months, and returned the same summer.

Karlsefni then set out with one ship, in search of Thorhall, but the greater part of the company remained behind. They sailed to the northward past Kjalarness, and then bore to the westward with the land on their port side; there were wooded wildernesses there. And when they had sailed a long time, a river flowed down from the east toward the west. They entered the mouth of the river, and lay to by the southern bank . . . . They sailed away back toward the north, and believed they had got sight of the land of the Unipeds; nor were they disposed to risk the lives of their men any longer. [They intended to explore all the mountains, those which were at Hóp, and those which they discovered[3]).

They sailed back, and passed the third winter at Straumsfjord. Then the men began to divide into factions, the unmarried men claiming the wives of those who were married. Snorri, Karlsefni's son, was born the first autumn, and was [there "þann"[4]) when they went away;[5]) they got a southerly wind and came to Markland, where they found five Skrælings, ... They said, that another country lay on the other side, opposite to their own, where people lived who wore white garments, and uttered loud cries, and carried poles, and went with flags (flíkr). People believe that this must have been Hvítramannaland. [Now they came to Greenland, and stayed with Eric the Red for the winter[6]).

Bjarni Grimolfsson was driven with his ship into the Greenland Sea[7]) . . . .

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[1]) Hauksbók has: "at night".

[2]) *M* has: "verit í hafi" instead of "verit í Hópi".

[3]) From [Hauksbók has: "They concluded that the mountains of Hóp were the same as those which they now viewed, and there appeared to be nearly the same distance from Straumsfjord to both places".

[4]) It is not clear to what the "þann" refers. From [Hauksbók has: "three winters old"; *M* has: "with his father".

[5]) Hauksbók adds: "on sailing from Vinland"

[6]) In Hauksbók this sentence is lacking.

[7]) Hauksbók has: "Ireland Sea".

ICELANDIC ANNALS. — In addition to the sagas of the discovery and exploration of Vinland and Markland, these countries find mention in the chronological lists of notable events, in and out of Iceland; which are known as the Icelandic Annals[1]). Among the recorded events of the year 1121 it is stated that:

"Eric, Bishop of Greenland, went in search of Vinland".

And in other Annals we find, against the year 1347, the following record:

"There came also a ship from Greenland, less in size than small Icelandic trading vessels. It came into the outer Stream-firth. It was without an anchor. There were seventeen men on board, and they had sailed to Markland, but had afterwards been driven hither by storms at sea".

I will remark in consequence of these last records that it is not impossible that the Northmen in Greenland had frequent communication with southern Labrador, possibly to obtain timber for their ships and houses; and perhaps, as Hovgaard and Gathorne-Hardy have mentioned, to settle when all communication with the mother country stopped, and they were displaced by the Greenland Eskimos. The present Eskimos in Labrador say[2]) that some old ruins, the position of which, and the manner of building being different to Eskimos' (e. g. never built with a long passage-way) have been inhabited by "Tunit". These people had crossed the sea, tradition says, from Greenland; they were few in number "but in stature and physique superior to the Eskimo, whose central habitat appears to have been the archipelago about Nain and Port Manners". The Eskimos were on hostile terms with the Tunit, who were gradually driven into Baffin Land. Gosling writes in his book on Labrador[3]) that the ruins possibly are connected with the ancient Northmen's visits to America.

It is not improbable that this is the case, but I will, however, refer to the ancient Greenland legend where a fabulous people of a similar name to Tunit is mentioned[4]).

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[1]) Reeves op. cit. p. 79—83.

[2]) Gathorne-Hardy in "The Geographical Journal", March, 1922.

[3]) New York. 1911.

[4]) A man in Angmagsalik told me in 1884, that the fabulous inlanders, whom he called "Tunermiut", "came down to the sea at Tasiusak, in the spring to fish. They were tall people, just as long as an umiak, some were, however, small; many had long beards which often was fair." — According to Kleinschmidt's Greenland dictionary, p. 380, "tunua" means East Greenland (from "tunuk"-back), and "tunuarmio" means a Greenlander from the East coast. Rink writes in "Medd. om Grønl." XI. p. 157 that the Greenland word "tuneq" which mean "fabulous inlander" is also to be found amongst Labrador Eskimos and Central Eskimos where it means "a strange nation formerly existing".

Discussion.

As mentioned before, Steensby came to the result that both Leif's Vinland and the country visited by Karlsefni must be placed on the south bank of the St. Lawrence River. I think, however, that this solution of the problem is founded on a regretable mistake, as in reality he has only dealt with Karlsefni's voyage, and only occasionally mentioned Leif's voyage. In the following discussion I have endeavoured to show that Steensby has most likely solved the question as to where Karlsefni has been on his expedition, but on the other hand not where Leif's Vinland was.

KARLSEFNI DID NOT FOLLOW LEIF'S ROUTE. — Steensby writes[1]): "Leif discovered Wineland and the other countries; Karlsefni and his men followed the route given by Leif to the countries, and refound them all".

Steensby declares[2]) that his investigation relies solely on "Eric the Red's Saga", but nothing is said in the saga about Leif having found "the other countries", although it is likely enough that he had seen them whilst sailing on his way back to Greenland. Neither is there any mention of Karlsefni having "followed the route given by Leif" to these countries and "refound them all". Later Steensby writes[3]) "if there had not been a question of a conspicuous fjord and a fairly conspicuous "Hóp", one would not think that both of them could be refound comparatively easily by Karlsefni", and finally[4]) "There is no absolute geographic likelihood of first Leif and afterwards Karlsefni having actually crossed Cabot Strait from Newfoundland".

So it is Steensby's opinion that Karlsefni followed Leif's route. Hovgaard has already pointed out that Karlsefni profited by the knowledge of Thorstein's unsuccessful voyage (p. 20) — the route of which was most likely pointed out by Leif — and therefore went quite another way to begin with. Therefore, when Steensby occasionally mentions Leif's voyage, it is likely he was thinking of his voyage from Greenland, which is mentioned in Grænlendiga þáttr in the Flateyjarbók[5]), for it can hardly have been his idea that if Leif, on his way from Norway had been driven to the neighbourhood of the Golf of St. Lawrence, he would have continued his voyage up the St. Lawrence River to the neighbourhood of Quebec; but according to what he has written it looks like it, as he places Leif's Vinland on the south side of the St. Lawrence River. Moreover, it appears that Steensby has thought of Leif's voyage in Grænlendinga þáttr as he has named his paper "Norse-

[1]) op. cit. p. 156. [2]) ibid. p. 155. [3]) ibid. p. 158. [4]) ibid. p. 166.

[5]) According to the same saga Fossum also placed, as mentioned before, Leif's Vinland in the neighbourhood of Quebec.

men's route from Greenland to Wineland", as he did not wish to have anything to do with the casual discovery of the country. If he had done so he would also have mentioned Bjarni's doubtful voyage (p. 18).

We can surely take it for granted that it was not Steensby's intention to avail himself of Leif's voyage in Grænlendinga þáttr, but would have corrected this mistake later on. The printed paper was only the first production that was to have been followed by another; if this had not been his intention he would not have gone over to those regions, especially to study all particulars.

Steensby's paper was received with great interest; and with regard to Karlsefni's voyage, it must be said, it was very surprising and a simple understanding of the saga tale, which treated of a coasting voyage. It concerns only this voyage, one must not consider his mentioning Leif's voyage. However, it does not lessen the significance of this well merited work.

I presume Hovgaard was the first to propose that the country Leif discovered, which later on was called Vinland, was quite another country to the one which Karlsefni came to on his great expedition, which started from Greenland, and the aim of which was to explore the country found by Leif, and if possible to settle there. I completely agree to this view.

HELLULAND TO THE SOUTH OF GREENLAND. — We are now going to mention Gathorne-Hardy's critical remarks[1]) on Steensby's paper. His first remark applies to Steensby's identification of Helluland with a place in Labrador which in opposition to ancient accounts, lies about on the same latitude as South Greenland, and "involving a course very far to the west of south". To this I will remark that, according to the Saga Karlsefni sailed first to Vestri Bygd and "thence" (þaðan) — as Hauksbók adds — to Bjarneyja". Steensby and Fossum say that these islands most likely lie in the vicinity of south-east Baffin Land[2]) and the direction from there to Helluland is south, and consequently not "very far to the west of south".

It is written in Hauksbók that Karlsefni "bore away southward" (p. 21) from his northly starting point, whilst there is no mention of a course in AM. 557, but that he sailed for "northerly winds".

[1]) op. cit. pp. 238, 241—243.

[2]) This is confirmed as according to many manuscripts it was not Vestri Bygd but Vestri Óbygd that Karlsefni last came from (Reeves op. cit. p. 133, note). It is written in the following manner in *M* (p. 21): "Then they sailed away from the land to "vestari úbygðir" and thence to Bjarneyja". — I agree to Fossum's opinion (op. cit. p. 71 and 103) that "hina vestri óbygð" which Eric already had visited, possibly was Baffin Land.

However, as the ancient Icelandic geography AM. 194 (p. 17) says that to the south of Greenland lies Helluland, this must be right. Meanwhile we must remember how uncertain the Northmen's statement of direction was, and I will refer to Bjørnbo's declaration in "Cartographia Groenlandica"[1]). If one takes the given turning of 45 degrees, in the stated direction "south" the direction from Vestri Bygd would just coinside with the northern part of Labrador.

COASTING FROM HELLULAND. — Concerning the next point, namely the mistake in Karlsefni's voyage being considered as a "coasting voyage throughout, with no intervals of open sea between the different lands visited", Gathorne-Hardy's idea is that the Northmen were just navigating pioneers. He writes that the first discovery of Vinland was accidental, and that the open sea had to be crossed so as to be able to return to Greenland again. He therefore thinks that the following expeditions would, as far as possible, follow their predecessors route until they had reached Vinland, the only place considered worth visiting and exploring.

It may be correct, but can be very difficult for a sailor to carry out. Thorstein Ericsson (p. 20) whose expedition was the first to start from Greenland in search of Vinland, steered out to sea in all likelihood in the direction from which Leif came, but they drifted about on the sea eastwards and could not steer west towards land, presumably on account of prevalent, strong north-west winds[2]). Taught by this expedition's unfortunate experiences Karlsefni, as already mentioned by Hovgaard, went northwards so as to get a good height before he sailed across Davis Strait with the prevalent north-westerly winds,

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[1]) A. A. Bjørnbo: Cartographia Groenlandica (Medd. om Grønl. Vol. XLVIII p. 83). "Independant of each other Finnur Jónsson and Fridtjof Nansen, with whom we have had the chance of discussing the question, have expressed that in the individual country the trend of the coast was the determinative of the conception of direction; thus landnorðr (north-east) means in reality the direction in which Norway's coast runs northwards, utsuðr (south-west) the way in which one sails from Norway to the British Islands, and the southern countries. Nansen's opinion is that this naturally cohers to the inclination of only using the four main directions and when giving a direction only using the terms North and South, until the deviation is beyond 45 degrees after which one said East and West. Nansen thinks that one ought to explain the names Eystri- and Vestribygd in this manner, which presupposes a turning of about 45 degrees westward; in the same direction as in Knytlingasaga and in King Alfred's accounts. Finnur Jónsson has furthermore drawn one's attention to the fact that the indications of direction were without doubt introduced into Iceland from Norway uncriticised; which easily can have misled the Icelandic authors in their statements."

[2]) V. Garde: Windcharts of the northernmost part of the Atlantic and of Davis-Strait. Copenhagen. 1900.

and from Helluland he did not leave the coast as there had been no necessity of doing so.

Gathorne-Hardy writes[1]) how difficult and dangerous the navigation of Labrador's coast is in early summer, on account of floating ice, which Karlsefni does not mention. Gagnon thinks that Karlsefni has continued sailing from Labrador along Newfoundland and would hardly venture into the Strait of Belle Isle where the state of ice is nearly always difficult.

It must be remarked that floating ice is not once mentioned in the sagas, neither here nor in the navigating of Eystri Bygd in Greenland. The Storis (floating ice) in the time of the Northmen, could not have been in such masses at the place last mentioned, as at present, where it blocks the Bay of Julianehaab the greater part of the summer[2]). That the Storis increased during the historical period is mentioned in ancient accounts[3]) and is a necessary stipulation so as to be able to understand how the ancient Northmen had been able to navigate Eystri Bygd, the present Julianehaab's district[4]). It is not improbable that the floating-ice's manner of proceeding has undergone a similar change on Labrador's coast.

After Karlsefni's expedition had left Helluland, Steensby continues[5]), "Thence they sailed for two days and bore away from the south to the south-west". This must be a mistake, as, instead of the last clause, it is written in Hauksbók "and bore away from the south toward the south-east" (p. 22), whilst in AM. 557 there is written "with northerly winds", which presumably is right. Therefore Steensby cannot take the turning "south-west" for granted that Karlsefni followed the coast of the mainland through the Strait of Belle Isle.

Steensby writes further on[6]): "Thence (i. e. from Markland) they sailed for a long time southwards along the land, and came to a promontory. The country lay to starboard; there were extensive sandy

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[1]) op. cit. pp. 242 and 264.

[2]) Medd. om Grønl. Vol. VI p. 181; Vol. LXI p. 380.

[3]) Ivar Bårdson's description of Greenland: ". . . thette vaar gammell seylling, en nu er kommen is udaff landnordenbotne . . ." (Medd. om Grønl. Vol. XX, p. 322).

[4]) Medd. om Grønl. Vol. VI, p. 73. — All old lists of fjords and churches issue from Herjulfsness (the present Ikigait) where the sagas also mention that the ships first came to land. This place, Ikigait, could now only with great difficulty be navigated on account of the floating ice. — O. Pettersson has in "Klimatförändringar i historisk och förhistorisk Tid", Upsala og Stockholm 1913, examined the reason for the change in the spreading of the Storis in the 14th century. He expresses a theory that Baffin Bay and the Labrador stream being one thousand years ago relatively free of ice, which influenced the climate of Newfoundland and North America; in short, the polar ice melted at higher latitudes than it does now.

[5]) op. cit. p. 164. [6]) ibid. p. 166.

stretches of beach". On account of the indefinite information concerning directions, the given direction can perfectly well have been south-west and the course was completely omitted in AM. 557. There is certainly a distance here where it looks as if Karlsefni, after having left Markland, could have left the coast and gone to sea. Steensby has, as is known, used Hauksbók, but AM. 557 has quite another wording for this part, namely: "Then when two days had elapsed, they sighted land and they sailed off this land; there was a cape to which they came. They beat along the coast, having the land upon the starboard side. This was a bleak coast (öræfi) with long and sandy shores" (p. 22). They called this coast Furdustrands because it took a long time to sail along it. By the beginning of this citation one could possibly come to the conclusion that they had been two days in the open sea, but this is not probable, it is more likely that the predominant fog on this coast has hidden land from them.

This is the only indication as to Karlsefni having deviated from sailing along the coast after having reached Helluland. When I admit that the voyage was continued along Labrador's south coast, it is because I agree with Steensby, that it presumably would be impossible to find a stretch of coast on America's north-east coast that would suit the saga account better, about its nature and the length of time it took to sail along it, also the name Furdustrands, which Finnur Jónsson[1]) translates by "the remarkably-long coast".

THE UNCERTAINTY OF KJALARNESS. — On account of Gathorne-Hardy's remark about Steensby having, contrary to the saga, inserted Kjalarness after Furdustrands, and close to the outset of Straumsfjord, I will refer partly to the uncertainty of the saga on this point and partly to Steensby's own doubt about the correctness of this identification; he closes in saying[2]) "Possibly a visit to the spot would give a more definite impression as to the probability of Port Vaches being the ancient Kjalarness". As known he went to America on purpose to investigate all doubtful points, but died on the way home.

WINTERING IN STRAUMSFJORD NOT ON STRAUMSEY. — We have now come to Straumsey, which Steensby identified with Hare Island[3]). Gathorne-Hardy writes[4]): "Straumsey is identified with Hare Island, which even at the present day is described as densely wooded, an unlikely place, one would think, for quantities of breeding sea-fowl, and ill-adapted as a pasture land for cattle".

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[1]) Opdagelse af og Rejserne til Vinland (Aarbøger for nordisk Oldkyndighed og Historie. 1915) p. 210.

[2]) op. cit. p. 199. [3]) ibid. p. 173. [4]) op. cit. p. 243.

Presumably there is no reason to reject Steensby's identifying Straumsey with Hare Island, because there was no pasture for Karlsefni's cattle, and on that account several of his arguments fall to the ground. The wintering did not take place at Straumsey but on the mainland at Straumsfjord. Steensby has misunderstood the Saga. He writes[1]): "They steered into a fjord, outside which lay an island; a rapid current ran round it, therefore they called it Straumey. There were such a number of eiderducks on the island that one could hardly move for eggs. [They called this place Straumfjord] and here they discharged the cargo and prepared to remain; they had all sorts of cattle with them". We will at once notice that there is something curious in the wintering place at Straumsey being called Straumsfjord. And if one looks in AM. 557, instead of the words enclosed in brackets there is written: "They sailed into the fjord and called it Straumsfjord" (p. 22). — Professor Finnur Jónsson has remarked that an Icelander never would call a wintering place at Straumsey for Straumsfjord, and he also says it is not even written in Hauksbók. There is written: "þeir kolluða þar Straumfjorðr". The word "þar" which is translated as "this place" does not mean the island but the fjord, which has just been mentioned.

So it was not on the island they unshipped, and had their winter quarters. This was also later confirmed, as after the severe winter, it is written in AM. 557 (p. 23): "Then they went out to the island in the hope that something might be forthcoming in the way of fishing or flotsam". Later on when the weather had improved, there is written in Hauksbók as well as in AM. 557: "In the spring they went into Straumsfjord, and obtained provisions from both regions, hunting on the mainland, gathering eggs (on the island), and fishing in the sea". If the cattle had grazed the whole time on the island, there was not much use commending it for its eggs, which the cattle easily could have deranged. Finally there is written that: "Thorhall prepared for his voyage out by the islands" (p. 23), whereat one must imply that the others are on the mainland.

The wintering has without doubt taken place on the mainland, where there was high grass, but it was a severe winter for which they had not prepared, and they all agreed that they had not reached Vinland — look at Thorhall's first verse (p. 23) where he blames the country and says "there came not a drop of wine to my lips".

THE IDENTIFICATION OF HÓP WITH MONTMAGNY (ST. THOMAS). — Gathorne-Hardy writes concerning the identification of Hóp[2]): "Finally, Professor Steensby's Hóp, at St. Thomas, faces north, which is in conflict with the saga, where we are told more than once

[1]) op. cit. p. 172. [2]) op. cit. p. 243.

that the Skrælings came in from the south. From the situation of Karlsefni's camp by the lake it is clear that the arrival of the savages could only have been perceived after they had entered the estuary, which must accordingly, if the authority is to be trusted, have faced south rather than north".

It may be correct that St. Thomas lies on the south side of the river and therefore faces north; but it may also be correct that the Skrælings came from the south. They were of course discovered as they came from the river. When one looks down the river from the promontory outside St. Thomas the direction one looks in is north-east to north. So one can justly say that ships coming in from sea came from the north, and when the Skrælings came from the river the Northmen would say that they came from the south, even if the compass at St. Thomas pointing up the river is nearer west-south-west; but as mentioned above the Northmen's statements of direction are rather uncertain.

WINTERING AT HÓP VERY DOUBTFUL. — The principal complaint that has been raised against Karlsefni's Hóp being identified with St. Thomas and which was brought forward by Gagnon, Babcock and others, was that in the saga it is written that they not only found self-sown wheat-fields and vines, but that in the winter "no snow whatever came, and all of their live-stock remained in the open, finding their own pasture" (p. 24). The critics say that this place is quite inadmissible and rejectable on account of the climate and natural products. Gagnon expresses serious doubt as to there being grapes of such quality and quantity in those parts which could entitle the Northmen to call this place Vinland. To this I will add a few remarks.

Steensby states as a result of his investigations[1]) that Karlsefni's Hóp was at St. Thomas (Montmagny) and that the Northmen's Vinland was the surrounding country, and in an extensive signification the St. Lawrence valley.

These are two quite different points which must be kept apart. Steensby has in reality only discussed the first one, and as it seems to me, in such a way so that none of the critics have shaken it. Therefore I will only add, with regard to the condition during winter, that possibly Karlsefni never has wintered at Hóp, as "some men say" that they "stayed at Hóp barely two months, and returned the same summer" (p. 25). In the saga, is previously written, after the glories of the country near Hóp had been told of (p. 24) that "they remained there half a

[1]) op. cit. pp. 185 and 201.

month"[1]). If Karlsefni has only been away on the voyage to Hóp a few months and not a whole year we understand much better that immediately on returning to Straumsfjord he left with one ship in search of Thorhall (p. 25). If it had been a year after Thorhall's departure it would have been perfectly hopeless to search him.

It is not without reason that a doubt about wintering at Hóp is expressed in the saga. When the saga narrator has spoken of the winter's mildness, he has probably had a wrong intuition; as the summer had been much warmer than at home in the Bygd, it was reasonable to assume that the winter would also be warmer.

If we compare the mean air temperature between Julianehaab (the Northmen's Eystri Bygd) and Quebec, the result will be as follows. In July the temperature in Julianehaab is about + 8° C. and in Quebec + 20°, and in January the temperature in Julianehaab is about ÷ 6° and in Quebec ÷ 11°. So in July it is about 12° warmer in Quebec than in Julianehaab, and in January it is about 5° colder in Quebec than in Julianehaab. If Karlsefni had wintered at Montmagny he could not have eluded noticing the severe winter there, not only in comparison to the warmth during the summer but also in comparison to the winter at home. As they spent the first winter further north in Straumsfjord, the saga relates, that the winter was severe which they were not prepared for (p. 23). They did not think that after the warm summer a winter would come that would be much severer than at home in the Bygd; therefore they had not laid up provisions for winter and they suffered want. In the surroundings of Quebec the summer is warmer than at the estuary of the river but the winter is not milder. The saga's "some men" (p. 25) are on that account sure to be right when they say that Karlsefni came back during the same summer to the first wintering place in Straumsfjord[2]). The advantageous conditions mentioned about the winter's climate at Hóp are in all probability fictitious, and I can refer to what Hovgaard says about the inclination to exaggeration either by the discoverer himself or of a later saga narrator so as to improve the tale or emphasize the new country's good qualities.

If the Northmen have not wintered at Hóp, the observations of the winter's condition will be left out, and with them, I think, the chief complaint against Steensby having identified Hóp with Montmagny near Quebec.

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[1]) In the manuscript *M* these two opinions are united, as instead of "verit i Hópi" there is written "verit i hafi" (on the sea voyage) for two months.

[2]) When the wintering at Hóp is omitted the whole expedition has only lasted two years. The manuscript *M* does not state as Hauksbók does, that Karlsefni's son Snorre was "three winters old" when they left Straumsfjord, but that he was "with his father" (p. 25).

KARLSEFNI DID NOT REACH LEIF'S VINLAND. — Steensby did not enter closer into the second point, namely that the Northmen's Vinland should be the surroundings of the St. Lawrence valley. It is my opinion, nevertheless, that it requires further explanation, and I will state my opinions about it.

Nothing is said in Eric the Red's Saga about Karlsefni having found Vinland, whilst there is much that implies that the country he reached being quite a different country to Leif's Vinland. After Leif's short stay in Vinland and the return voyage across the ocean one would naturally have difficulties in finding the land again. When, after Karlsefni's expedition's first winter at Straumsfjord, there was a question of travelling further, Thorhall the Hunter[1]) would go northwards in order to find Vinland, but Karlsefni would go southwards along the coast and east of the land, as his opinion was that it would be "more advisable to explore in both directions" (p. 23).

If, as Steensby supposes, it was the St. Lawrence River's estuary they had come into, Karlsefni must, I suppose, have taken the St. Lawrence River for a Sound, otherwise he would not have sailed into it. He certainly came quickly to the apprehension that the direction he had taken could not lead to the east of the mainland and therefore could not lead to Leif's Vinland which ought to lie at the outer coast, and that the pilot Thorhall surely was right, when he said they had to go northwards, and out of the estuary again so as to find Vinland. When Karlsefni returned from Hóp to Straumsfjord, most likely during the same summer, after having only been away two months he sailed in search of Thorhall the Hunter (p. 25) whom he did not find, after that all further travelling was given up.

In AM. 557, Eric the Red's Saga, there is no mention of Karlsefni's reaching Vinland. In Hauksbók there are two faint hints, namely in the heading of the chapter which is called "Beginning of the Vinland voyage" (p. 21), and towards the end it is written, as they sailed away "from Vinland" (p. 25) southerly winds rose. The first hint is not to be found in AM. 557, I suppose it has been purposely omitted, as there is only written that Karlsefni and Snorre decided to "leita Vínlands", neither the last one is there, and must be due to a mistake in Hauksbók, the fact is that they sailed away from Straumsfjord, which they them-

[1]) The long talk about Thorhall the Hunter (see p. 21) evinces us, that he has been a trustée of Eric the Red, and therefore was onboard ship with Eric's son Thorvald as a sort of pilot "þvi at honum var viða kunnigt í óbygðum". Fossum (op. cit.) has remarked, that it is very likely, that he had taken part in Eric the Red's voyage the second summer to "vestri óbygðar" (Baffin Land?) and therefore partly was acquainted with the route for Vinland.

selves did not regard as Vinland, for Thorhall's, as well as Karlsefni's voyages, the year before issued from there "ok leita svá Vínlands".

It is written in the ancient Icelandic manuscript AM. No. 194, that Karlsefni sallied forth "to seek Vinland the Good, and came there where they supposed this land was, but they did not acquire any knowledge of it, nor obtained any of its products" (p. 18). It sounds very uncertain! It can neither be Straumsfjord nor the surroundings of Hóp that Karlsefni did not get to know, and from which he did not obtain the country's products, as he was there for some time; and when there is written that they supposed they had reached Vinland one can certainly take it for granted that it was not the country discovered by Leif.

Although Karlsefni never reached it and never thought that he had refound Leif's Vinland, it is very likely that Northmen and later Saga narrators have called the whole newly discovered country, Karlsefni's as well as Leif's, for Vinland, with the same right as the whole is now called America, and as we now call the world's biggest island, from south to north Greenland, because Eric the Red gave this name to the country he discovered saying "it will encourage people to go there when the country has an enticing name"[1]).

CONCLUSION

To conclude with, I will remark, that we only know to a certainty that the Northmen visited America's mainland twice. The first time it was Leif Ericsson who on his return voyage from Norway to Greenland was blown out of his course to the country. He landed and found self-sown wheat-fields and vines and "mösur"; and related on his return of the fertility of the country. The land was called Vinland.

The second voyage started from Greenland under the charge of Thorfinn Karlsefni. It was an expedition composed of several ships, the aim of which was to seek Vinland the Good and explore it. Having learnt through the experience of Thorstein Ericsson's voyage, undertaken the year before, they did not take the direction from which Leif came, but crossed Davis Strait at a more northern latitude and reached Bjarneyja. From there they sailed to Helluland whence they tried to follow the coast southwards as they believed in that manner they ought to be able to find Leif's Vinland. They first reached Markland and then Furdustrands. They then sailed into Straumsfjord where they unloaded the ships and wintered.

The winter was severe, and they were not prepared for it; but when the spring came there was good fishing and hunting. Karlsefni and

[1]) Grønl. hist. Mindesm. I. p. 169.

Thorhall the Hunter consulted together as to which direction they should take so as to find Vinland. Thorhall was of the opinion that they ought to go northwards whilst Karlsefni would first try whether he could go southwards and east of the land. He was namely of the opinion that they ought to try both ways. After Thorhall's departure northwards, Karlsefni sailed for a long time southwards and reached Hóp where self-sown wheat-fields and vines were found. It is also reported that no snow whatever came and that the cattle were in the open all winter finding their own pasture, but this is hardly believable, as it is very doubtful their having wintered in Hóp at all. They had intercourse with the natives.

When Karlsefni returned to Straumsfjord from Hóp, presumably the same summer, he undertook a voyage in search of Thorhall, which was unsuccessful. After wintering at Straumsfjord they sailed to Markland where they were in communication with Eskimos, and they returned after that to Greenland.

There is no mention of Karlsefni having found Leif's Vinland. The discovered land was fertile, but troubles with the natives, together with mutual controversies necessitated the expedition to return to Greenland.

I presume that the country Karlsefni reached was not Leif's Vinland. I will not touch on the correctness of Steensby's pointing out that Karlsefni's exploring voyage was on the St. Lawrence River, and the identification of several places, for it strikes me as being very difficult now to decide the places. I sympathize, however, more with Steensby's identification than with any of the other authors'.

Finally I will remark that, according to ancient Icelandic Annals it is highly probable that Northmen in Greenland were at a later period in communication with Markland, the southern part of Labrador.

The information about Vinland in the ancient primary sources is very scarce so that it is hopeless to occupy oneself with Leif Ericsson's voyage, but there is no reason why we should reject the general theory that Leif was driven over to America's east coast, probably to New-England, where he landed. "There were self-sown wheat-fields and vines growing there". Boston is the biggest town on that tract where Leif must have discovered the land and on that account it may be with full justice, that the fine statue of Leif Ericsson was raised in 1887 in Boston in memory of the first Northman setting foot on America's mainland.

IV.

SOME OBSERVATIONS MADE IN NORTH-GREENLAND 1923

BY

F. FRODA
COM. R. D. N. R.

(WITH 12 FIGURES IN THE TEXT AND 2 TABLES)

1924

In the summer 1923 I visited Greenland in order to inspect the local stations of the Danish Meteorological Institute. Besides I had opportunity to make some observations:

1. regarding the glaciers of the Blæsedalen near Godhavn in the island Disko;
2. regarding the sinking of the land.

Before commenting on these topics I wish to underline, that my observations may be regarded only as set forth by a layman.

The glaciers of the Blæsedalen in Disko.

During my stay at Godhavn Mr. M. Porsild, Master of art and chief of Den Danske Arktiske Station (The Danish arctic station) laid before me some maps, drawings, photos and measurement results, which Professor P-L. Mercanton had sent him and which concerned Mercanton's inspection of the Blæsedal-glaciers in 1912. Further Prof. Mercanton urgently had asked Mr. Porsild to take interest in a repeated measurement in the same place, when opportunity might be given. Accordingly Mr. Porsild proposed to me to undertake an inspection of the glaciers, and I readily complied with this proposal, so much the more because I had had myself[1]) an opportunity to assist at the examining of these glaciers in 1897 (see Med. o. Grl. XIV, p. 295).

Besides placing the said material at my disposal Mr. P. lent me an excellent theodolite. Equiped in this way I started on the 6th of August on an excursion to the Blæsedalen.

Mercanton had undertaken some measurements of less importance only at my two stations from 1897, whereas I had thence not at all occupied myself with the southeast corner of the Lyngmarksbræ, to which Mercanton mainly had paid interest in 1912.

My cairns from 1897 stood fairly uninjured, and I undertook therefrom remeasurements, as also I made drawings and photographs of the glaciers. It appeared that more of the fixed points, which I had chosen — marked projectings of the mountains — had during the passed 26

[1]) under the name Frode Petersen.

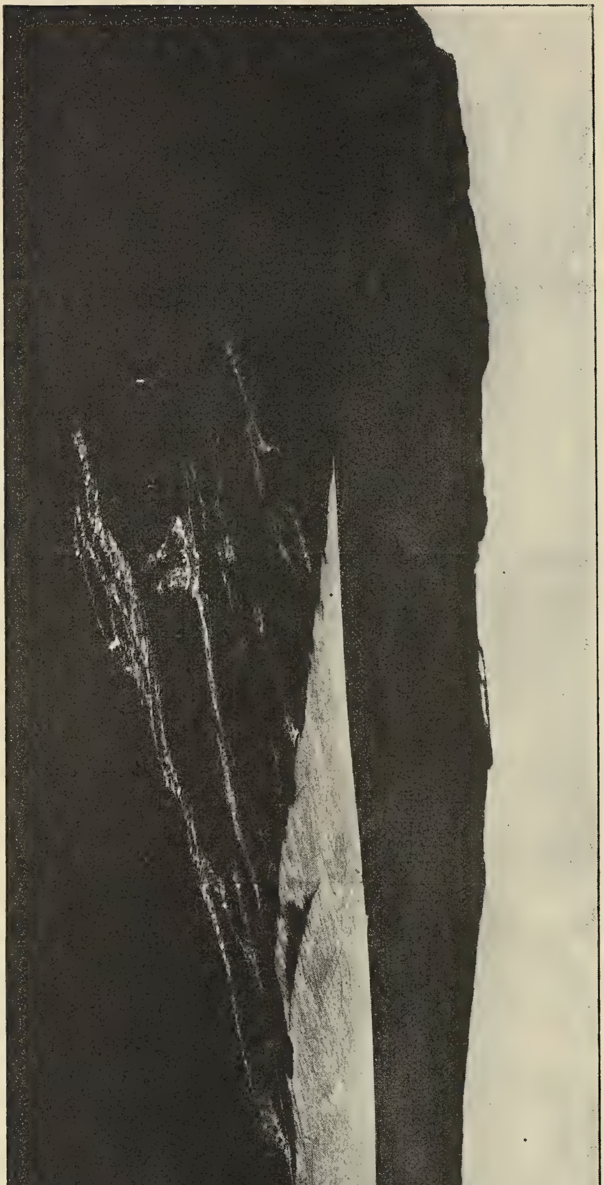


Fig. 1. Lyngmarksbræ from stat. I.

years been exposed to strong decay, which had lessened already now their sharpness, still not to such a degree, that the exactness of the measurements is influenced.

The diminuation of the glaciers as well in extend as in thickness since 1897 was very obvious. From stat. I it was now impossible to make tangential aims to the southern glacier (Mercanton: Lyngmarksbræ), and from the same point glacier number 2 at the western side of the valey (Mercanton: gl. Petersen) could no more be seen. I wish to set forth some remarks regarding the annexed tables A & B, which ought to

Fig. 2. Glacier Petersen from stat. II.

be compared with the tables X and XI of M. o. G. XIV. In the same way as in the latters I have again marked the measurements from stat. I with stippled lines and those from stat. II with full lines. As zero I have used the same point as in 1897 viz. a sharp fall at the edge of Unartorssuak (Lyngmarksfjeldet). I have marked the present limits of the glaciers with blue lines, whereas red lines indicate the extention in 1897. From stat. I the aim to stat. II is 170°31′ (not marked in the tables).

It ought to be observed regarding stat. I, that aim 21°25′ does not regard the edge of the glacier, but the point where the glacier is disappearing behind the projecting soil. Aim 45°41′ regards the extreme point of a (lateral) moraine, which was not observed in 1897. Aim 66°50′ is probably a glacier-port. Aim 70°30′ does not indicate the edge

of the glacier, but the point where it is disappearing behind the projecting soil. Aim 233°40′ to the glacier at the eastern side of the valey (Mercanton: gl. Pjetursson) has no corresponding aim in 1897.

The points A and B in tab. A are the stations of Prof. Mercanton, who used even these indications. M-N (in both tables) is an imaginary section.

When I had finished my measurements etc. at stat. I & II, I proceeded to the front of the southern glacier, where I measured (nearly in the line M—N) the distance from the edge of the glacier to the distinct front-moraine from 1897; the distance was about 220 meters. Generally spoken the space of ground which had been uncovered since 1897 was quite even, partly swampy or traversed by a network of small brooklets and spred with stones, still none of great size. Indeed nothing of all does tell of a temporary advancement of the glacier during the past 26 years; nor no terminal moraine was found in front of the present edge of the glacier, only at the northeast corner, but in some distance from the ice, lay a great heaping up of rough material, traversed by several, at that moment dry water-courses, but it must be remembered, that even that part of the glacier has always been the lowest point and the place, where the main outlet has had its issue.

For the sake of elucidating the time when the glacier had retracted I noted, that the stones in the brooklets on the lower part of the uncovered ground were closely covered with green confervas, and on the small mound a little inside the terminal moraine (*b* at tab. B. 3) several plants were found, viz. besides some graces Chamaenerium latifolium, Oxyria digyna (both fulgrown and with flowers), Salix groenlandica (a cotyledonous specimen more than 6 years old), Saxifraga rivularis and Saxifraga cernua — and perhaps some more[1]).

I should not suppose that the said little mound *b* may be regarded as a terminal moraine, but rather that the two deepenings *a* & *c* on each side of it are due to watercourses along the front of the glacier at a time, when the retraction has been slow; still some water flew in *c*. (On the uncovered ground I saw in more places fine crystals (rock-crystal?) deposited in cavities in loose stones).

Considering that the front part of the glacier was steep and inaccessible in 1897, whereas it was quite thin and smooth in 1923, the statement of Mercanton[2]) — a retraction of 70 m during the 15 years till 1912 — and my statement of 220 m retraction during 26 years — e. i. 150 m in the 11 years from 1912 to 1923 — will together give a

[1]) these plants have been identified by courtsey of Mr. M. Porsild.

[2]) Ergebnisse der Schweizerischen Grönlandexpedition in Denkschriften der Schweizerischen Naturforschenden Gesellschaft, B. LIII, p. 290.

good picture of the facts, viz. a retraction, which accelerates proportional to the diminution of thickness of the ice.

On the basis of comparisons made on the spot between my drawings from 1897 and the actual circumstances in 1923 I have got the impression on the whole, that much less there is a question of melting edgewise than of a general diminution in thickness of the ice. Still this is perhaps regarding the glaciers only, whereas — at all events partly — other circumstances prevail regarding the "mother-ice" beyond (see later).

As already mentioned the front edge of the southern glacier was quite thin — some cm only — and it seemed to be quite "dead". The moraine which I have indicated on the sketches a little inside the edge of the ice was quite fresh and consisted of as well fine as rougher material: medium sized stones lay scattered all round on the ice, whereas the finer material formed a sharptopped mound up to 1 m high. Immediate behind this moraine there was a traverse crack in the glacier. Although the crack was closed at the moment, the moraine material must have proceeded from it. The crack continued a little distance to the south from the moraine — some 20 or 30 m perhaps. I suppose that the existence of this moraine is due to the presence of a cup-shaped cavity in the ground beneath, a cavity with high and firm limitation to the east, which will force the ice and the scoured off material upwards. I should be apt to suppose that the ice above the crack, e. i. west of same, partly has sidemovement northward, whereas the ice on the eastside, as mentioned, seems "dead". Besides I presume, that the moraine is identical with the gravel heap, which Pjetursson mentions in M. o. G. XIV p. 294 (at the bottom).

The glaciers were perfectly snowbare. The summer 1923 has been unusually dry, sunny and warm, and the preceding winter was extremely deficient in snow; for that reason the melting has passed beyond the usual limits everywhere. Regarding the season the Røde-elv as well as its tributary affluents from the glaciers were highly abounding with water and difficult to pass. The surface of the southernmost glacier was slightly granulous or porous because of the sun-irradiation, and it was easy to go upon; the incline was nowhere so great that I could not walk upon the glacier in usual european boots without sliding. In numerous small cracks the water purled down the surface. In short the condition of the glacier was so, that anybody, who might have wanted to undertake scientific investigations, would have had excellent opportunity to do so. Unfortunately I had got no time for the tempting task: to level — even quite roughly — the surface of the glacier.

When afterwards traversing the glacier to the south a short distance

before reaching the middle (the most elevated part of the front) I observed several small mounds just outside the edge of the ice; they looked as if they had been formed a short time ago only. I deemed them to be about 1 m high. Curiously their direction was perpendicular to the front of the glacier, what I cannot explain, unless they have been formed by the melting-water.

Along the southern side of the glacier e. i. beneath the slope of Unartorssuak, a brook had formed its bed in the surface of the ice to a depth of 1 to $1^1/_2$ m, but the bed was only partly filled with water

Fig. 3.

at the moment. This brook joins the main outlet from the southeast patch near the latters glacier-port (fig. 3). Parallel to the southside of the glacier and near to it lay more mounds or moraines, 3 to 4 m high and consisting of very heterogeneous material; some of them — at all events — lay on "dead" ice.

Professor Mercanton had expressed the wish, that fixed marks should be placed as near as possible to the front corner of the south-east-patch, which he had measured in 1912; these marks should be fixed points for periodical measurements of the position of the ice. However, I found the soil so swampy and evidently in a so non-disposited state, that the placing of marks would be in vain.

The cairns at Mercanton's measurement-stations A & B were found unhurt as shown in his photographs; his results have been derived by

way of photogramtry, and he states, that in 1912 the vertical distance between stat. B and cote II (practically the same as the nearest point of the ice) was ÷ 2,40 m. My measurements with theodolite from stat. B, in using the horizontal distance of Mercanton, gives a vertical distance of + 0,26 m between B and the nearest point of the ice, which, just as in 1912, lay a little north of the glacier-brook. I have supposed the inclination of the ground in the vicinity of the edge to be 15° to 20° and I have got my supposition strengthened through calculations of the elevations between cote I & II and cote II & III respectively in M.'s sketch-map. Starting from the abovenamed change in vertical distance and the supposed inclination, I find that the edge of the ice has retracted about 10 m from its position in 1912. I explain this retraction, small as it is in comparison with that of the northeast part of the glacier, in the quite natural way, that the southeast patch is extending down in a rather narrow valley, the sides of which and the close-to Unartorssuak will derive the glacier of direct sunshine a great part of the day, and further it may be the case, that this part of the glacier has not altogether ceased to move.

On account of the change in form of the glacier I could not refind the points, which M. indicates as cote I & III, and consequently I could make no remeasurements. The close position of M.'s curves of level tells of a thickness and declination of the patch of the glacier, which was not traceable any more; accordingly I venture to say that also in this place the melting of the glacier goes on principally as reduction in thickness.

No more than in 1897 I got opportunity to visit the neighbour glacier to the north; however, I have calculated — as did also M. — from angels and estimated distances the retrogradation as well of glacier no. 2 as of no. 3 on the opposite side of the Blæsedalen, well knowing that the estimation of distances is very approximate only. The results are:

	Retrogr. 1897—1912	Retrogr. 1897—1923
Glacier no. 2 (gl. Petersen acc. to M.)....	80 m	150 m
— - 3 (- Pjetursson — - -)....	40 -	60 -

Judging by local observations and the photographic material at hand I wish to point out some facts:

The ice on the top of Unartorssuak to the right of aim 37°17′ (from stat. I) projected in 1923 as a pillow over the edge of the mountain, whereas the same part was ice-bare in 1897. The little bare rock in the middle of M.'s photo from stat. A has a rather steep wall against a partly ice-bare valley along the NW-side of the glacier. The glacier-

(By courtsey of Prof. Mercanton

1912

1923

Fig. 4 & 5. The southeast corner of Lyngmarksbræ from stat. A.

By courtsey of Prof. Mercanton.) 1912

1923

Fig. 6 & 7. The southeast corner of Lyngmarksbræ from stat. B.

patch just to the north of the same rock ends "dead" in the said valley. Comparing my photo from stat. A with that of Mercanton it is obvious that the ice in the background to the right is not so thick as in 1912. Comparing on the contrary the photos from both stations, it is seen that the pillow of ice beyond the abovementioned little rock has increased and perhaps advanced from 1912 to 1923.

I had my station-cairns I & II mended and enlarged. I stands very conspicious on an eventopped hill, II is situated on the top of a boulder against the slope of a hill.

Fig. 8. The eastern part of the great terminal moraine of Blæsedalen.

Note. Through my measurements in 1923 I have substantiated that a regretable misprint is found in sketch 1 tab. XI M. o. G. XIV, viz. the aim from stat I to fixed point no. 2 from the left ought to be *25°27′* and not 15°27′.

Referring to the observations made by H. Pjetursson in 1897 and his remarks in M. o. G. XIV p. 298 at the bottom, p. 299 in the close of 1st section and p. 302 l. 9 f. t. b., I want to state, that during my visit to the Blæsedalen in Aug. 1923 I observed a very conspicious, great, round and dark spot — without vegetation — on the inner side of the eastern part of the great terminal moraine in the Blæsedalen. Outside the moraine is found a small lake (which has not been indicated in the sketch-map 1897); as far as I could state its flowing off is some distance east of the Røde-elv. I suppose that the spot and the lake have something to do with one another, and I explain the spot as a falling in on account of lively percolation.

The annexed photo has been taken from a point somewhat above

the cascade in the Røde-elv and delineates the same part of the great terminal moraine, but seen from the south. Notice the cut of the Røde-elv through the moraine.

The sinking of the land in the present time.

Godhavn. In 1897 I undertook some measurements with the aim that later on they might form a basis for determinations regarding the size of the sinking of the land (M. o. G. XIV p. 346). In Aug. 1923 I got opportunity to remeasure in the same place. In levelling from 13 balanus stripes I found as a medium that these stripes were situated 79 cm below the fixed point, which I marked in 1897. As the corresponding distance in that year was 94 cm, the land has sunk 15 cm in this periode of 26 years.

For the sake of later orientation it ought to be noted, that the blubber magazine (Spækhuset) on the northside of the harbour, which is seen in the sketch in the cited place in M. o. G. has now been altered a little as to the windows (see fig. 9). "Peter Brobergs Hus", which is mentioned, is situated a little to the west of the Administration-building (Landsraadsbygningen) at the point where the coast is bending towards the creek, whose opposite coast is Nunguak (Malemuk-Næs).

Fig. 9.

The abovementioned and indeed very positive results of the observations at Godhavn made it momentous to me also in other places

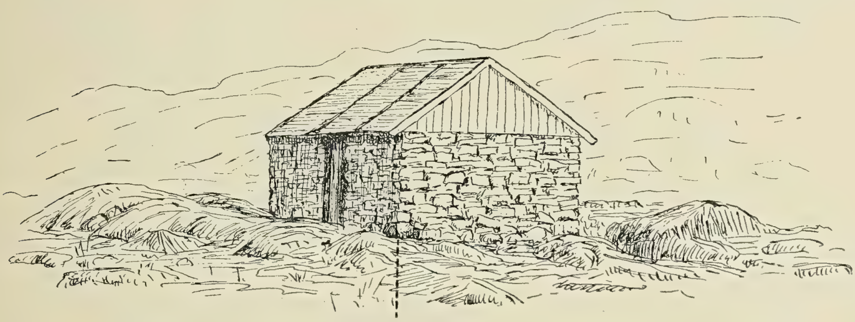


Fig. 10. Petroleum-magazine at Tipidôk near Egedesminde.

to undertake measurements, which eventually later on might be a basis for determination of the sinking of the land.

Egedesminde. At the harbour itself the possibility for measurements to that purpose are very impropitious. Accordingly I searched in the neighbourhood and I found good balanus at the little creek Tipidôk abt. 1 km east of the colony; at that place I measured on the 9th of Aug. 1923. As datum I chose the upper edge of the first stone in the northwest corner of the petroleum-magazine at the creek. The levelling

to 15 good balanus stripes gave as a medium, that the position of these is 3,25 m below the datum (see fig. 10).

As that possibility is obvious, that the petroleum-magazine may be demolished or altered before a sufficient number of years has elapsed, I also undertook measurements in another place, viz. at the creek on the westside of Ausiat (Egedesminde-Øen) south of Smallesund. On the 11th of Aug. 1923 I here found as a medium of levelling to 17 balanus stripes a distance of 1,97 m below a chosen datum, which I have marked with a +, engraved on the flat topside of a big stone (see fig. 11). The topside is partly covered with lichens, the vertical sides are lightcoloured

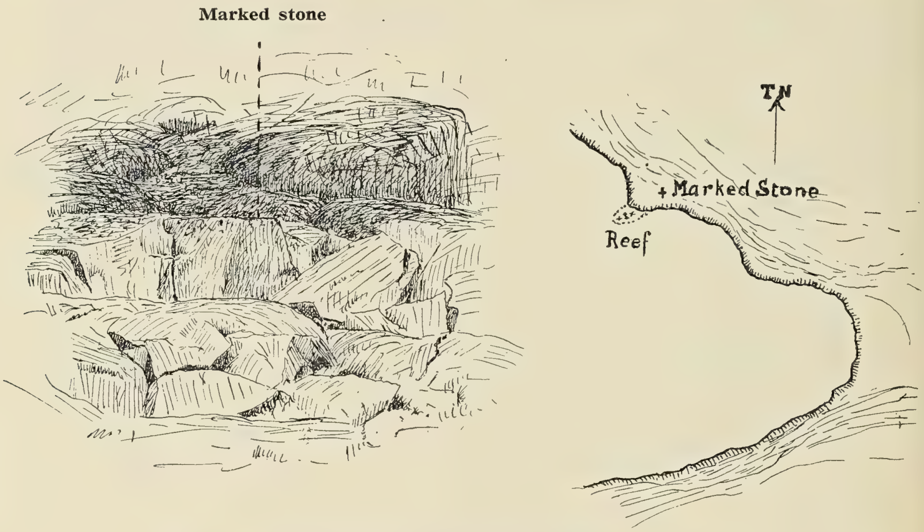


Fig. 11. Marked stone at creek south of Smallesund.

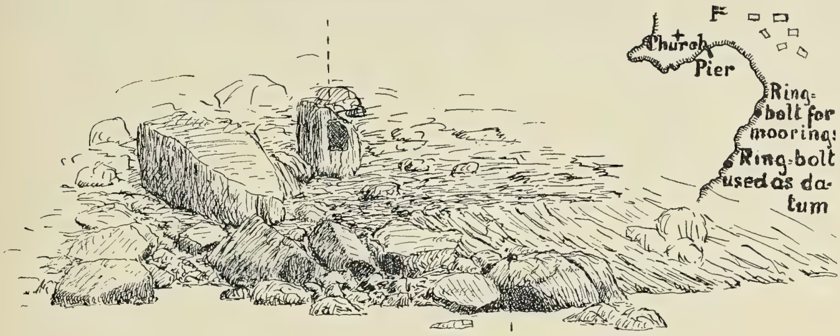
and the lower edge is a little above the highwater mark (some little grass is growing close to). Otherwise the stone is directly continued by the elevating ground behind. The neighbouring stones and boulders are of a light colour and seawashed. The sketch is drawn from one of those boulders more seawards, which rise above the surface at highwater, whereas they are lying on a little naze at lowwater. A young Greenlander, Emil Nielsen, living at Egedesminde was my aid when measuring; eventually he may later on be a guide to the place; still he was not present when the + was engraved, and he is not aware of its presence.

At Upernivik, Prøven and Umanak no balanus were found; instead I had to seek for stripes of sea-wrack, which according to my observations in different places form quite as sharp lines as the balanus; generally the medium upper limit of the sea-wrack is a little below that of the balanus.

Unfortunately however, I could find neither at Upernivik nor at Umanak sea-wrack of use in accessible places.

At the factory (Udstedet) Prøven conditions were far more propitious, and I had opportunity to measure on the 23th of Aug. 1923.

Redcoloured anchorage mark



Ring-bolt

Fig. 12. Boulder with ring-bolt at Prøven.

The result of my levelling to the top-edges of 13 stripes of sea-wrack was a medium-distance of 1,20 m below a chosen datum, which is that point on the topside of a large boulder in the beach where a ring-bolt is fastened in the boulder (further information in the fig. 12, which has been drawn from ship in anchorage).

Former sinking and reelevation of the land.

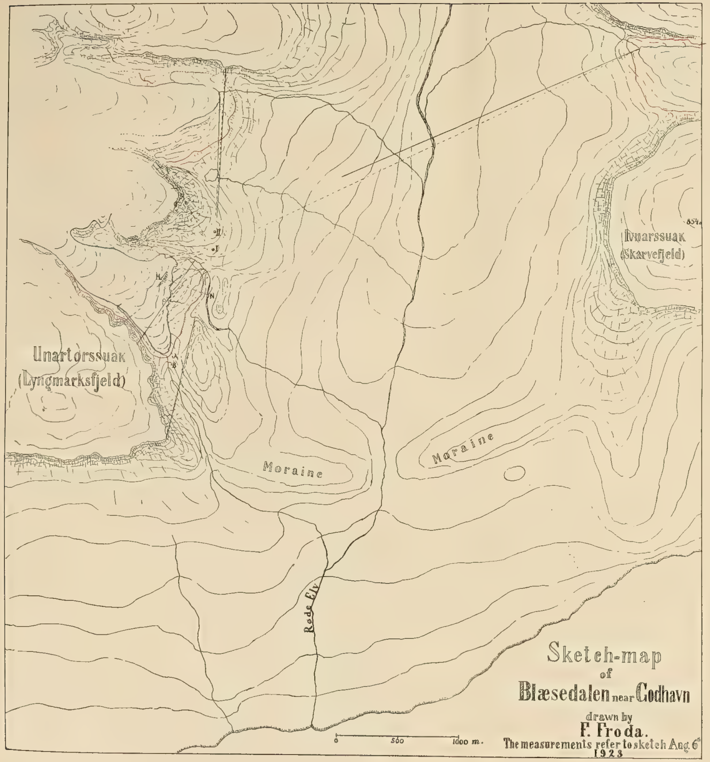
In the island of the colony Umanak I made an excursion to the Spraglede Bugt at the western side of that island. When mounting the hill (with a cairn) just south of Spraglede Bugt my attention was drawn to a multitude of very different-sized stones and boulders strewn all over the rather even upper part of the domical top of the said hill. As well the places and positions as also the forms of these stones impressed upon me the decided opinion, that this portion of the hill had not been inundated by the sea at any periode after the time, when the land had been denuded from the landice. The greater part of the said, irregularly spread stones on the hill top, could impossibly have remained in such positions as their present, if a surf had had an opportunity to work upon them. A fair portion of gravel was found on the hill top, but I suppose, that it origines from disintegration and frost-bursting.

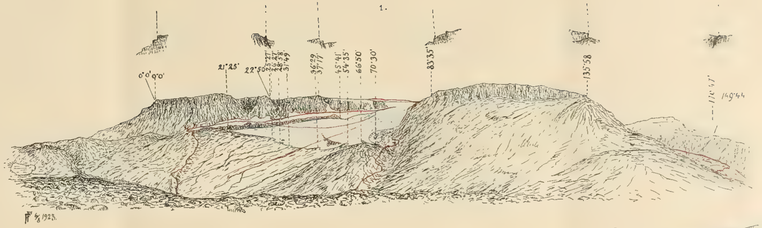
On the next hill to the south (also with a cairn) the case was a similar, but not so decidedly expressed; indeed this hill is also lower than the former.

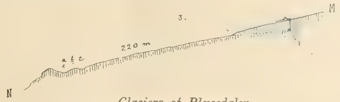
Southwest and south of the high Umanak-mountain I saw at a distance one or two cupolas, on which were also scattered a great quantity of stones, as far as I could make out.

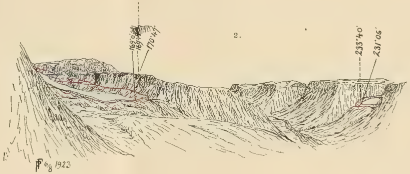
If I be right in my abovementioned suggestion, it may be decided rather exactly to which point the land has been inundated.

I only want to add, that in other but lower lying places in the same island are found characteristic sea-margins with lots of rolled stones.









Glaciers of Blæsedalen.

1. From Stat. I.
2. » » II.
3. Section N-M (see tab. A.)
   Stippled lines refer to measurements from Stat. I.
   Full lines refer to measurements from Stat. II.

V.

RÉSULTATS SCIENTIFIQUES DE L'EXPÉDITION SUISSE AU GROENLAND 1912-1913

ÉLABORÉS ET RÉDIGÉS PAR

ALFRED DE QUERVAIN

(ZURICH), CHEF DE L'EXPÉDITION

ET

PAUL-LOUIS MERCANTON

(LAUSANNE), CHEF DE L'ESCOUADE OCCIDENTALE

AVEC DES CONTRIBUTIONS DE MM.
DR. MED. HANS HOESSLY †, DR. W. JOST, DR. A. STOLBERG.
K. GAULE † ET R. FICK
MEMBRES DE L'EXPÉDITION AINSI QUE DE MM.
PROF. DR. GRUBENMANN †, DR. A. BRUN, V. NORMANN ET
DE L'INSTITUT MÉTÉOROLOGIQUE DU DANEMARK

RÉSUMÉS PAR MM.
DE QUERVAIN ET MERCANTON

AVEC QUATRE PLANCHES

1925

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NB. Sauf signature contraire le texte est de M. de Quervain.

PRÉFACE

Le plan de notre expédition de 1912 et en particulier de notre traversée de l'inlandsis, est issu d'une première entreprise, réalisée avec le Dr. A. Stolberg et le Dr. E. Baebler. En 1909 nous avons visité la côte occidentale du Grönland et fait une expédition de plusieurs semaines sur l'inlandsis. Cette première visite dont quelques résultats principaux seront communiqués plus loin[1]) nous a montré l'intérêt d'une continuation de ces travaux et en particulier d'une nouvelle traversée, au nord de la première route de Nansen. Il m'a semblé que des Suisses, auxquels les montagnes donnent une certaine habitude du névé et glacier et de leurs problèmes, seraient bienvenus à collaborer à ces recherches de géographie arctique.

Le Grönland, la plus grande île du globe — plutôt un continent qu'une île — n'avait pas encore été traversé dans sa latitude moyenne; depuis la traversée de Nansen, jusqu'à celles de Peary, qui ont fixé la limite septentrionale, s'étendait sur une distance de 1500 km une terra incognita; au point de vue topographique et géographique, al tâche fondamentale de la première exploration demeurait. En particulier la question se posait, si on retrouverait le profil si régulier de Nansen, qui en conclut à des épaisseurs de glace d'environ 1500 m, ou si une couche moins épaisse permettrait l'apparition des formes du fond, peut-être sous forme de nounataks ou même de groupes de montagnes. A ces questions géographiques se joignaient plus spécialement les problèmes du climat de l'inlandsis, dont on ignorait les conditions d'été pour les zones centrales. Leur connaissance, surtout la relation entre la pression, la circulation du vent, la température et les précipitations avaient gagné une actualité nouvelle par la discussion du rôle des anticyclones formés par un inlandsis.

Je tenais à complêter le programme de façon à garantir des résultats scientifiques même au cas où la traversée n'aurait pas réussi. Un

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[1]) Voir plus loin Première Section.

groupe spécial, dirigé par Mr. le prof. Dr. P.-L. MERCANTON, de Lausanne, l'»escouade occidentale« devait rester à la côte ouest pour se vouer à des travaux glaciologiques sur le bord de l'inlandsis.

Mes compagnons et collaborateurs à la traversée du Grönland ont été le Dr. H. HOESSLY † de Samaden (Grisons), l'ingénieur K. GAULÉ † et l'architecte R. FICK, de Zürich. A leurs qualités je dois une grande partie du succès. J'ai le regret de dire que les deux premiers ne sont plus parmi les vivants.

Les compagnons de Mr. MERCANTON, le Dr. A. STOLBERG de Strasbourg et le Dr. W. JOST de Berne, devaient après son départ pour l'Europe en automne 1912, hiverner dans l'île de Disco, à la Station arctique et exécuter une série hivernale de sondages pour l'exploration de la circulation de la haute atmosphère.

Tout ce programme a été exécuté conformément à notre plan, grâce aux mérites de mes collaborateurs.

Je remercie encore une fois nos amis suisses, qui ont rendu possible cette entreprise au point de vue matériel. De même nous remercions les Sociétés savantes suisses, qui nous ont procuré des moyens, avant tout la Société Helvétique des Sciences naturelles, qui a pris aussi partiellement la charge d'une première publication complète. Malgré ces contributions et celles de personnes privées, il est resté une lourde charge pour le chef de l'expédition et son collaborateur Mercanton.

Nous sommes particulièrement reconnaissants au Gouvernement danois, et surtout à l'Administration des colonies du Grönland, — sous la direction d'abord de C. Ryberg et ensuite de Mr. Daugaard Jensen, — qui ont fait pour nous tout ce qui était en leur pouvoir; nous avons trouvé les mêmes dispositions chez tous les fonctionnaires, au Grönland même; MM. les bestyrers et pasteurs nous ont soutenus de leur mieux; qu'il me soit permis de citer ceux avec lesquels un séjour prolongé nous a liés, MM. Thron Olsen et Friedriksen à Holstensborg, Ohlsen à Jacobshavn et Petersen à Angmagsalik, et MM. Stoklund, capitaine et styrmand, du »Fox« — M. le capt. Kjøller — et M. Morten Porsild — et tous ceux que nous regrettons de devoir omettre. De même nous avons à remercier de leur intérêt la Commission pour les Recherches Géologiques et Géographiques au Grönland, et son président, M. l'amiral Wandel.

Nous savons apprécier à sa valeur l'honneur que cette Commission a bien voulu nous faire en recevant dans cette série renommée des »Meddelelser om Grønland« un exposé de nos principaux résultats.

Ce sont les savants danois qui avant tous les autres ont conquis scientifiquement ce continent arctique par leurs recherches approfondies. Nous les remercions d'avoir si bien accueilli notre modeste part de

collaboration et nous voudrions — qu'au milieu des mémoires importants de cette série, ce spécimen de travail helvétique fasse pourtant honneur à notre pays et à la jeune génération des géographes suisses.

Zürich, avril 1924. *A. de Quervain.*

Résumé chronologique de l'expédition de 1912—13[1]).

Le 2 avril 1912, nous avons quitté Copenhague sur le navire de l'Administration danoise »Hans Egede«; après avoir passé le 13 le Cap Farvel, nous sommes arrivés le 16 avril à la colonie grönlandaise Godthaab et avons profité du court séjour pour faire l'ascension du Hjortetakken. Le 19 avril, »Hans Egede« a continué vers la colonie de Sukkertoppen, où nous avons fait du 20 au 22, l'excursion au Sermilikfjord. Le 24, nous avons atteint notre but provisoire, Holstensborg. Au commencement de mai, le groupe qui devait faire la traversée est parti pour Sarfangùak et de là vers Kùk, à l'intérieur du fjord, pour apprendre la pratique des chiens. Le 15 mai, nous sommes rentrés à Holstensborg et avons quitté cette colonie avec »Fox« le 1 juin. Nous avons atteint Egedesminde le 4 juin et l'avons quitté le 6 juin, pour arriver à Jakobshavn le même jour, en passant par Akùgdlit. Après nous être procuré les chiens à ces 3 endroits, par l'intermédiaire des fonctionnaires danois, (parmi lesquels nous remercions particulièrement Mr. Krogh) nous sommes partis le 10 juin par le détroit d'Ata, jusqu'à l'effluent Ekip Sermia, point de départ de la traversée à la côte, appelé Quervainshavn par M. Stoklund, le capitaine du »Fox«.

Ici commençait la traversée des rochers jusqu'au bord de l'inlandsis. Le groupe de la traversée est parti le 20 juin du bord de l'inlandsis, accompagné pendant 2 jours par le groupe de l'ouest. La plus grande altitude de l'inlandsis a été atteinte le 8 juillet, le bord est, le 21 juillet. La vitesse moyenne sur l'inlandsis — en décomptant 1 jour de repos — a été de 22 km par jour. (Des 30 chiens, nous avons dû tuer l'un déjà à la côte ouest et 3 autres en route). Le 24 juillet, nous avons trouvé le dépôt, le 30 juillet, nous y sommes tous arrivés, le 1 août, le chef de l'expédition est parti pour Angmagsalik avec des eskimos, en kajak. Le 4 août, les 3 compagnons y sont arrivés aussi, de là on a fait une excursion en bateau, dans un but anthropologique. Le navire »Godthaab« au bord duquel se trouvait Mme de Quervain, nous y prit le 29 août 1912

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[1]) On trouvera le récit de cette expédition dans le livre: "Quer durchs Grönlandeis", par A. de Quervain. Munich et Bäle 1914. Voir pour les résultats aussi le volume.

et nous ramena le 8 septembre à Reykiawik en Islande; le 29 septembre, nous sommes rentrés avec le navire »Sterling« à Copenhague, où nous avons été salués par une délégation de la Société Royale de Géographie de Copenhague et reçu en audience par S.M. le roi de Danemark.

Le Groupe de l'ouest (Mercanton, Stolberg et Jost) a travaillé entre temps, au bord de l'inlandsis, jusqu'au 19 août (du 13 au 21 juillet, ils avaient fait des tentatives pour atteindre un nounatak) — le 19 août, ils ont quitté Quervainshavn et atteint le 22 août Jakobshavn en oumiak et en kajak. M. Mercanton est allé par le storbaad à Godhavn, le 28 août, pour y visiter quelques glaciers du Blaesedal le 2 septembre, et en est parti le 6 septembre, avec »Hans Egede« pour rentrer en Europe.

Deux membres de l'Expédition, le Dr. Stolberg et le Dr. Jost, sont allés avec le voilier Thorvaldsen à Egedesminde et de là ils ont voyagé avec le bateau de la station arctique à Godhavn, au milieu de septembre. Leuis travaux aérologiques ont duré d'avril 1912, jusqu'à la fin de mai 1913 (en mai 1912 le Dr. Jost est parti avec le magister Porsild pour une exploration de l'intérieur de Disko, sur laquelle ces deux messieurs se sont réservé de faire une publication indépendante mais qui n'a pas encore paru). Le Dr. Stolberg est parti le 25 juin pour l'Europe avec »Hans Egede«. Le Dr. Jost a encore séjourné à Egedesminde jusqu'à la fin d'août, en dehors du programme de l'Expédition.

1913.

Première Section.

L'expédition de 1909.

Il convient d'esquisser ici les travaux de cette entreprise qui détermina en partie le programme de l'expédition de 1912 et en assura la réussite par l'expérience qu'elle nous apportait. Mes collaborateurs étaient: le Dr A. Stolberg, alors à Strasbourg, et le Dr E. Bäbler, de Zúrich. Voici les travaux principaux que nous avons exécutés:

I. Météorologie.

Notre activité principale se dirigeait vers la mesure de la circulation atmosphérique des hautes couches, à l'aide de ma méthode des visées de ballons-pilotes, qui promettait des résultats nouveaux pour ces régions pas encore explorées. La méthode et le matériel étaient les mêmes que nous avons employés en 1912. Pendant l'époque du 20 avril jusqu'au 22 juin nous avons fait une série de 64 lancers dont 32 dans la région de Godthaab et les autres pendant le voyage vers le nord; parmi elles 17 lancers à Godhavn, du 7 au 22 juin. La grande clarté de l'air favorisa nos mesures d'une façon inattendue. La plus grande altitude était de 20000 m, le 5 mai, la plus grande distance 48,5 km, le 26 avril. Le résultat général de ces mesures consistait dans la constatation surprenante de la prédominance absolue du courant venant du sud et du SE et d'un manque presque complet de vents d'ouest prononcés dans les hautes couches — ce qui contredit l'idée d'un tourbillon polaire régulier dans ces latitudes. Une série d'ascensions parallèles a été exécutée en Islande à Akureyri par les soins de l'Institut météorologique danois dont l'observateur P. Thorkelsson a fait 59 visées du 22 avril au 3 juillet, malgré le temps peu favorable. Nous allons préciser encore mieux ces résultats:[1])

La répartition de la pression lors de ces ascensions se caractérise

[1]) Voir le récit de ce voyage dans le livre: Durch Grönlands Eiswüste, par A de Quervain et A. Stolberg, Strasbourg chez I. Singer

par une séparation des minima situés à l'ouest et à l'est du Grönland. Ce continent paraissait couvert lui-même par un coin de pression plus élevée, descendant du nord. Très souvent, une dépression, dont la limite vers l'ouest n'était pas connue, se tenait à l'ouest du Grönland. Elle semble souvent se séparer des minima, lesquels venant de l'ouest, paraissaient être sur le Labrador méridional. Leur migration le long du détroit de Davis vers le nord était indiquée quelquefois par l'époque retardée des minima de pression aux stations plus au nord. Mais il s'agissait le plus souvent seulement de différences de 6 à 12^h, de sorte que les variations du baromètre concordaient presque sur toute la côte de l'ouest. Souvent elles indiquaient plutôt la pulsation d'un tourbillon stationnaire qui, à des intervalles très courts, souvent de 24^h seulement, amenait des augmentations et des diminuations de pression. On pourrait soupçonner ces variations d'être, dans le langage météorologique synoptique actuel, des fronts successifs, qui se suivent dans le champ d'une grande dépression.

La traversée de l'inlandsis par une dépression a été constatée une seule fois, le 5 mai, où à la côte ouest, nous avions des précipitations très remarquables à l'arrière de ce tourbillon, en correspondance avec cette dépression presque constante.

A la côte occidentale, le courant prédominant jusqu'aux plus grandes altitudes, a été un vent de SE, qui en général augmentait d'intensité avec la hauteur et qui se retrouvait quelquefois, jusqu'au dessus de 10000 m. Ce courant du SE existait déjà en avril, à la fin de l'hiver grönlandais à Godthaab et avec la progression de la saison, il paraissait diminuer d'intensité, mais il se retrouvait aussi plus tard, dans la région nord des colonies danoises, où il se montrait quelque fois au sol même. La correspondance avec les observations de Jakobshavn démontre, que dans ce cas, il s'agissit du föhn classique du Grönland. Cela permet d'identifier aussi ce courant général avec un phénomène correspondant au föhn, même si on le trouve seulement au-dessus de la circulation locale des premiers 500 à 1000 m. Tout de même, la grande extension en altitude oblige d'y voir autre chose que seulement l'air qui descend de l'intérieur refroidi du continent grönlandais. La limite inférieure de ce courant est en général bien nette, commençant quelquefois vers quelques centaines de souvent vers 1000 à 1500 m, mais aussi seulement à 4500 et même à 6000 m. Quand un minimum s'approche de la côte, la limite descend; quand il y a une aire de haute pression, on la trouve située plus haut.

La plus grande vitesse du courant du SE a été mesurée à Egedesminde, avec 45 m par sec. Il semble exister un maximum de vitesse vers 7000 m et un minimum relatif vers 11000 m. Les vents d'ouest et de NW manquent presque entièrement. Dans une seule ascension du

19 mai, on a été amené à croire, que le vent du NW observé dans les hautes couches, était en relation avec un minimum profond entre la côte de l'est du Grönland et l'Islande. Cependant il ne pouvait être question pour la durée de nos observations au Grönland et de celles faites en Islande, qu'un tourbillon polaire, quelque peu développé, y existât, qui aurait réuni les différentes dépressions des régions circompolaires, dans les hautes couches.

Nos mesures de ballons-pilotes ont donné quelques indices pour la détermination des hauteurs de nuages. On a mesuré 3 cas de nimbus, commençant à 1200 et à 1650 m (soirée du même jour) et de 1000 m, en plus un cas de strato-cumulus à 1800 m et 2 cas d'alto-cumulus typiques à 3250 et 4300 m. L'altitude des cirrus n'a pas pu être mesurée avec certitude. Dans 2 cas, on a pu déterminer une limite minima de 7000 m.

1. Les ascensions exécutées à Akureyri par l'Institut danois. Aux ascensions qui ont eu lieu à l'est d'un minimum, on est frappé par la constatation du courant du SW, jusqu'aux plus grandes altitudes. En Europe centrale, le vent tourne fortement à droite en ce cas. En plus, on est souvent frappé par des courants du SW, parce qu'ils trahissent des minima situés au NW de l'Islande qu'on n'aurait pas soupçonnés. Enfin nous relevons la grande extension en altitude et la constance des vents du NW et NE à l'arrière des minima islandais, qui ne correspondent pas à l'idée traditionnelle que les isobares sont ouvertes vers le nord dans les grandes altitudes.

2. Hydrographie. Dans les 2 traversées de l'océan, nous avons fait régulièrement des mesures de la température de la mer et avons pris des échantillons qui ont été examinés par l'institut océanographique de Berlin; de même nous avons fait des mesures d'évaporation, les premières qui aient été faites sur l'océan dans ces latitudes boréales. Les résultats ont été publiés par le Dr. Lütgens dans les "Annales d'hydrographie". Au Grönland nous avons fait à la fin d'avril et au commencement de mai des mesures de température et de salinité dans différentes parties du fjord.

3. Morphologie. L'intérêt principal se dirigeait sur notre itinéraire de l'inlandsis dans la région du Sermilik et du grand Karajak. Dans cette tentative qui se faisait à peu près avec les même moyens techniques qu'en 1912, mais sans chiens et dans une région plus difficile, on a atteint une distance maxima d'environ 100 km et une hauteur maxima de 1700 m. Nous reproduisons ici la carte de cet itinéraire. Le résultat général était le suivant: Beaucoup plus loin vers l'intérieur qu'on ne le savait jusque là, nous avons rencontré de grands systèmes de crevasses de même des gradins prononcés et des auges remplies quelque fois avec de petits lacs, qui avaient des relations évidentes avec les 2 systèmes

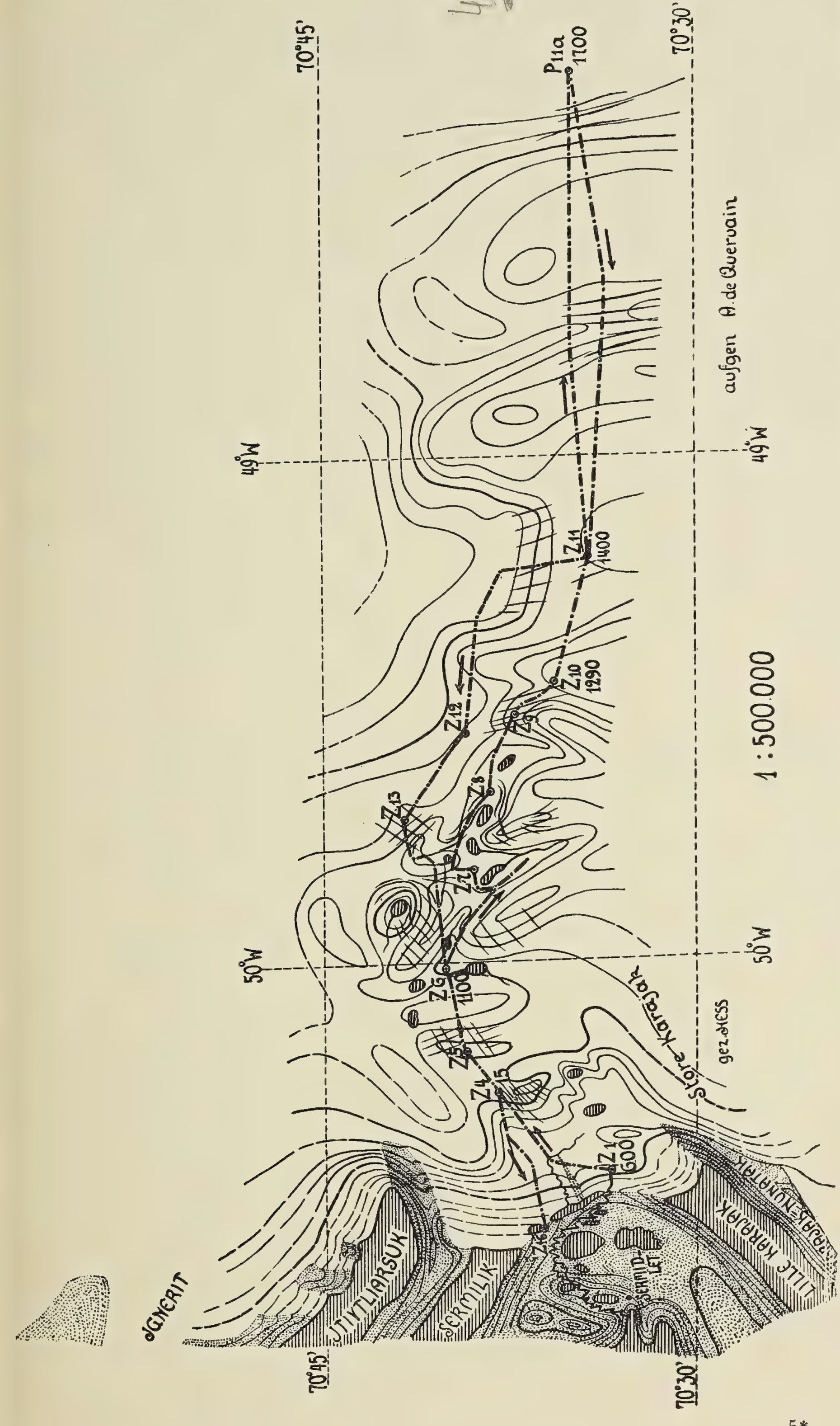
de fjords de la côte, orientés différemment, c'est à dire, avec les systèmes du Sermilik et Itivdliarsuk orientés NW—SE, et avec le système du Karajak, qui est orienté SW—NE. Plus loin, je vais donner quelques détails sur ce voyage sur l'inlandsis. Mentionnons encore les mesures anthropologiques exécutées par le Dr. Baebler et de même ses recherches sur la faune invertébrée nivale. Son expérience pratique dans ses dernières recherches dans les Alpes, lui permettaient de travailler avec beaucoup de fruit. Il s'est réservé la publication de ses résultats.

II. Observations topographiques sur le bord de l'inlandsis en 1909.[1])

Au bord de l'inlandsis entre le Sermilik et le petit Karajak (région contenue sur une carte de détail de Mr. de Drygalski) la glace est grise sur une épaisseur d'environ 50 m, par suite de pierres et de la boue qui y est contenue. Plus loin elle était tout a fait blanche si on faisait abstraction des trous de cryoconite, dont le fond était couvert, en forme de masse noire. Les crevasses étaient rares dans ce bord tout à fait extérieur. Par contre la surface était coupée par des sillons innombrables, taillés par la fusion. A partir du camp 3, la surface montait plus fort; nous avons mesuré des inclinaisons jusqu'à 12% et en même temps, la glace était de plus en plus crevassée. Vers le nord et le sud, le regard ne rencontrait que des systèmes de crevasses, qui se croisaient. Nous y avons perdu plusieurs jours en cherchant une issue par l'est, que nous avons trouvée le 15 juillet. C'était la seule sur bien des kilomètres vers le nord et le sud et il s'agissait de ne pas la manquer au retour.

Au camp 4, nous avons laissé une partie de notre charge en dépôt; au camp 5, nous avions atteint une sorte de dos, que nous appelions »Serakrücken«; le niveau était de 1000 m au-dessus de la mer. A partir de là, la surface devenait plus plane, les trous de cryoconite plus rares. Nous avions contre nous un vent continuel d'est ou de SE. La température variait pendant notre voyage entre +4 et —8. Pendant la nuit les petites nappes d'eau se gelaient toujours, même tout à fait au bord de l'inlandsis. Le ciel était souvent caractérisé par les nuages lenticulaires de föhn. A l'est de la plaine que nous avons traversée après le camp Serakrücken, il y avait de nouveau des "collines", allant de nord au sud. Elles étaient du reste bien moins inclinées que nous le croyions d'abord. A leur pied il y avait, à notre étonnement, deux petits lacs, l'un d'eux avait dû avoir une étendue plus grande; il restait encore des bancs de glace tout à fait blancs, qui se distinguaient de l'inlandsis gris. Un affluent venant du nord et d'une sorte de vallée, creusée dans

[1]) Voir l'esquisse d'itinéraire ci-contre. La maladie prolongée de l'auteur l'a empêché de l'élaborer davantage.



Itinéraire sur l'inlandsis de l'expédition suisse et allemande au Grönland 1909.

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le cours de la colline mentionnée, nourrissait ce lac. Dans cette sorte de vallée, à 1200 m de hauteur, nous avons retrouvé la première couche de neige, qui couvrait traîtreusement des crevasses. Cela nous obligeait d'avancer attachés à des cordes. Au fond de cette vallée, nous avons rencontré à notre étonnement un autre lac; son effluent, qui courait vers le sud était tellement fort et tellement creusé dans la glace, que nous avons dû rebrousser chemin et tourner ce lac au nord, pour arriver au camp 7. Dans la même vallée, nous avons rencontré plus loin un autre lac, situé dans une sorte de cirque et ensuite un troisième lac, plutôt une flaque d'eau. Au camp suivant, nous avons été retenus par le brouillard, alors qu'au camp 9, nous nous trouvions au beau soleil, sans vent et sur une surface de névé presque sans crevasses. Il n'y avait plus de lacs, mais encore des gradins et des cirques très plats, qui étaient orientés vers la région du grand Karajak. Les crevasses réapparaissaient; après un plateau, nous arrivâmes dans une faible descente, qui était encerclée par des systèmes de crevasses terribles. Les ponts de neige étaient douteux; c'était le camp 10. Le temps qui était à notre disposition pour l'avance était presque écoulé; nous décidions d'avancer encore un jour sur les skis et avec les traîneaux et ensuite Bäbler et moi devions pousser aussi loin que possible sur skis. Pendant cette dernière journée faite avec les traîneaux, nous avions à gauche un long dos à gradins, que nous appelions la colline du nord. Elle était par place déchirée par des crevasses larges de 20 à 40 m et presque toujours couvertes de neige ancienne. Celles-ci n'étaient béantes que sur peu d'endroits. C'est là qu'on voyait des dunes de neige. Quelque fois, on avançait sur une de ces crevasses dans laquelle le pont de neige était un peu enfoncée, comme dans une route naturelle. Le soir du 24 juillet, Baebler et moi avons quitté le camp 11 et avons avancé sur skis presque sans nous arrêter jusqu'à midi du jour prochain.

Nous avons trouvé la topographie suivante dans cette partie extrême de notre itinéraire: nous avons passé successivement 3 plaines ou plateaux horizontaux, chacun large de 10 à 12 km et chacun distingué du suivant par une montée de 50 à 100 m. Ces plaines nous faisaient l'impression de petits infinis; au haut de ces montées, nous avons rencontré chaque fois 10 à 20 crevasses parallèles s'étendant infiniment vers le nord et le sud, comme des routes. Elles étaient larges jusqu'à 20 m et en général couvertes par des ponts de neige. Là où les ponts s'étaient enfoncés, on pouvait distinguer très bien une stratification annuelle de névé. Des couches moins denses et peu cachées, transformées en glace se succédaient. Ce n'était du reste pas les crevasses les plus larges, que nous avons rencontrées au retour du camp 11; il y en avait, qui avaient 40 m de large. L'altitude à ce point extrême était de 1700 m. Vers l'est, autant qu'on pouvait voir, la montée de l'inlandsis con-

tinuait d'une façon semblable. A ce point, j'ai fait une détermination astronomique complète de longitude et de latitude. Le calcul à montré que la distance du bord de l'inlandsis dépassa un peu les 100 km. Mr. Baebler et moi avions fait en skis depuis le camp 11, environ 85 km, aller et retour. L'effort moral de notre compagnon Stolberg, de rester seul au camp 11, avec tcutes les éventualités que çela signifiait, n'était pas moins grand.

Pour notre retour, nous avons choisi un chemin situé un peu plus au nord (ainsi que la carte de notre itinéraire le montre), pour mieux encore connaître la surface de la glace. Pendant 2 jours nous avons utilisé une voile. Notre camp 12 a été caractérisé par un état de surface tel, qu'il y avait une croûte qui se rompait quand on n'était pas en skis et dans la neige pulvérulente, qui était au-dessous, on s'enfonçait jusqu'aux hanches, ce que, en ce terrain, traversé de crevasses en long et en large, causait toujours une certaine émotion. Au camp 6, notre itinéraire a rejoint la route de l'aller. La fusion avait déjà passablement changé l'aspect de la surface, et il a été très difficile de retrouver son chemin pour retraverser le Serakrücken. Déjà à l'aller, nous avions constaté qu'il n'y avait qu'un seul passage possible et celui-là, large de quelques mètres seulement. L'ablation avait beaucoup accentué toutes les inégalités; notre dépôt se trouvait sur un pied de glace, en forme de "table de glaciér".

On comparera ces indications sur notre première entreprise sur l'inlandsis, avec ce qui à été trouvé en 1912. On remarquera entre autres que la limite du névé paraît avoir été moins élevée dans la région du Karajak et que par contre, les grands systèmes de crevasses, semblent correspondre au très grands effluents de l'inlandsis (le Sermilik et les 2 Karajak) et à leur très grande vitesse d'écoulement, dont l'influence que nous avons déjà constatée se fait sentir dans l'orientation de la topographie de l'inlandsis, au moins jusqu'au camp 11.

Deuxième Section.

La Traversée de l'Inlandsis en 1912.

Ses Résultats topographiques.

Les bases de la détermination de l'itinéraire. Détermination astronomique des positions.

Les déterminations astronomiques avaient un double but. Avant tout elles devaient servir à atteindre depuis la côte ouest le point, fixé d'avance, de la côte est d'où seul un retour était possible. Mais en plus elles devaient fournir les coordonnées horizontales pour un but principal de la traversée, à savoir d'un profil d'altitude à travers le Grönland moyen. Etant donné ce but scientifique proprement dit, ces déterminations ont été exécutées avec un soin particulier.

a) Les instruments.

J'avais pris avec moi les instruments suivants pour les déterminations astronomiques:

1. Un théodolite de voyage »Hildebrand« possédant un cercle de hauteur qui permettait de lire les $^1/_2$ minutes et d'estimer les quarts. Le cercle azimutal est divisé en $^1/_2$ degrés permettant de lire les minutes entières et d'estimer les demies. Le grossissement de la lunette était de 16; elle possédait une vis micrométrique pour la détermination tachymétrique des distances. L'emploi de l'acier était évité dans cet instrument aussi bien que dans son pied pour le rendre applicable aux mesures magnétiques.

2. Un sextant de Plath. Le rayon du secteur était 18 cm, la division en 10′, le nonius permettant de lire les 10″ et d'estimer les 5″. Nous avons employé un horizon artificiel à mercure avec cuvette amalgamée et avec toit en mica. C'était l'instrument principal pour la détermination des positions.

3. Un sextant de poche anglais comme instrument de réserve, permettant de lire la minute. Une série de comparaisons faites au Grön-

land nous a prouvé que dans ces limites l'instrument concordait avec le grand sextant.

b) Exécution des observations.

Pendant le séjour à la côte ouest du Grönland l'observateur qui devait plus tard me remplacer dans cette fonction, Mr. Gaulé, a observé avec les 3 instruments et contrôlé la marche des chronomètres avec des observations an sextant, faites dans le premier vertical, ou bien à des hauteurs correspondantes. Pendant la traversée on a employé pour les déterminations des longitudes et des latitudes, presque exclusivement, les observations au sextant. Pour éviter l'influence d'une latitude un peu incertaine on a déterminé les latitudes le plus près possible du premier vertical, soit ouest, soit est, suivant l'heure d'arrivée au camp. Quand on a été obligé de faire les latitudes un peu avant ou après la culmination du soleil on a appliqué les réductions usuelles. Quand on a été obligé de faire l'observation de latitude en route, la mesure de distance et de direction soignée ont toujours permis une bonne réduction à la place du camp le plus rapproché. Les calculs ont été faits sur la base des éphémérides du »Nautisches Jahrbuch«, en tenant compte de toutes les corrections. L'exactitude des latitudes comportera en moyenne $\pm$ 10 secondes d'arc, l'exactitude de l'heure locale qui est à la base des déterminations de latitude, comportait 1 à 2^s; il survient l'influence de la marche des chronomètres dont il sera question plus loin.

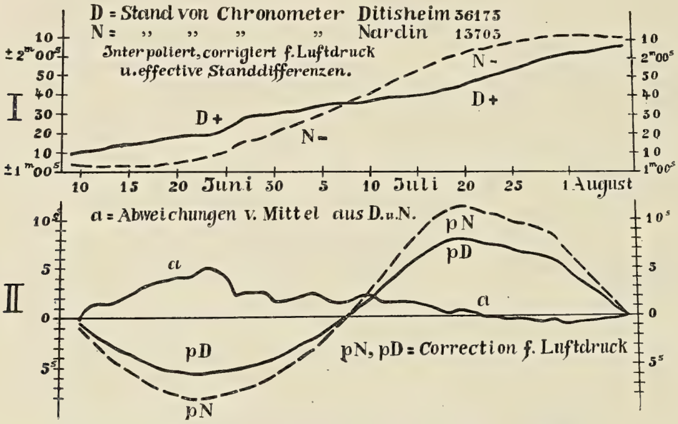
c) Les chronomètres.

L'emploi de chronomètres excellents avait une importance primordiale pour l'exactitude des positions en longitude; nous en parlerons donc avec un peu plus de détails. Les deux premières maisons de chronomètres suisses, Paul Ditisheim à la La Chaux-de-Fonds et Paul Nardin au Locle, avaient mis à notre disposition quelques-uns de leurs chronomètres sans égaux. Un petit chronomètre de marine Nardin et un chronomètre de poche Ditisheim restaient à la disposition du groupe ouest. Pour la traversée j'ai réservé le chronomètre de bord Ditisheim 36173, (désigné comme D1) et Nardin 13703 (N3) et enfin le chronomètre Nardin N2. Pour l'observation directe je me servais quelquefois du chronomètre de poche; toutes ces montres indiquaient l'heure de Greenwich, une montre de poche ordinaire à réveil était mise continuellement à l'heure locale.

Les chronomètres se trouvaient dans des étuis en bois qui ne laissaient voir que le cadre et le remontoir. Ces étuis étaient portés dans des poches bien adaptées cousues à gauche et à droite en haut du côté intérieur des pantalons. Il me semblait que c'était la meilleure façon de les protéger contre des secousses et contre des variations rapides de

température et de position. Pendant la nuit, les chronomètres étaient maintenus en position verticale à l'intérieur de mon sac de couchage. On les a comparés journellement entre eux.

A la côte ouest nous sommes partis d'une longitude connue. celle de Jacobshavn, de même nous avons atteint à la côte est Angmagsalik; en ces deux lieux nous avons fait des déterminations d'heure locale. Ainsi il ne s'agissait plus que d'interpoler correctement les états des



Comparaison des chronomètres durant la traversée.

chronomètres pour le laps de temps intermédiaire. Il faut mentionner ici une certaine complication provenant du fait qu'il n'a pas été possible de soustraire ces chronomètres à tous les incidents d'un voyage pareil. A l'occasion d'un de ces incidents assez grave, sur un lac dont la glace a cédé sous notre caravane, il est possible qu'une trace d'humidité ait pénétré dans 1 ou 2 des chronomètres de sorte que, pour ces deux-là, on est obligé d'admettre un petit changement de marche. Cela concerne les chronomètres D 1 et N 2, alors que le chronomètre N 3 qui n'a pas pris part à cette aventure ne paraît pas avoir subi une pareille influence. Pour procéder à l'établissement des marches définitives on a comparé, portées sur un graphique, les différences, déterminées chaque jour, des chronomètres N 2 et N 3 par rapport à D 1. Dans l'étude critique de cette différence on est arrivé aux conclusions suivantes: La marche moyenne des chronomètres D 1 déduite des déterminations faites aux côtes ouest et est en des endroits de longitude connue, immédiatement avant et après la traversée, est de $+ 0{,}998^s$. A la place de cette marche moyenne on a admis comme valeur la plus vraisemblable $+ 0^s{,}7$ du 9 au 23 juin; au delà $+ 1^s{,}3$ jusqu'au 29 juillet et à partir de là $+ 0^s{,}1$. Pour N 3 on a maintenu la marche moyenne de $- 1^s{,}7$ abstraction faite de l'influence de la pression. Aussi bien Mr. P. Ditisheim, qui, comme on sait, a été le premier à examiner cette influence

pour les chronomètres de poche, que Mr. P. Nardin, m'avaient communiqué des coëfficients qui permettaient de tenir compte de cette influence. Il paraissait très à propos de le faire en présence du fait que pendant la partie moyenne du voyage, la pression ne dépassait pas 540 mm, alors que la moyenne était de 666 mm et la pression au départ et à l'arrivée de 768 et 760 mm. Les corrections extrèmes appliquées varaient entre $+ 9^s$ et $— 11^s$ ce qui était donc loin d'être négligeable.

Sur cette base on a pu calculer pour chaque jour de la traversée les différences que devaient montrer les deux chronomètres et on a pu comparer ces différences théoriques avec les différences observées réellement chaque jour. Les corrections définitives qu'il fallait appliqueer ensuite à l'état de chaque chronomètre, pour faire disparaître cette différence étaient en moyenne $1^s,6$ et n'ont jamais dépassé 5^s. Les erreurs dans les déterminations de longitudes provenant des indications des chronomètres ne dépassent donc probablement pas 2^s, alors que les différences d'heure de camp en camp ne doivent pas atteindre la seconde. Les erreurs provenant des chronomètres ont donc été réduites au même ordre de grandeur que les erreurs provenant de la méthode de détermination de l'heure locale.. C'est sans doute un résultat remarquable étant donné la nature d'un voyage pareil.

Enfin il est intéressant de comparer les marches réelles des chronomètres, observées immédiatement avant et après la traversée, à celles qui ont été admises pendant les premiers et derniers jours de la traversée.

	Chronomètres D 1	Chronomètres N 3
Marche avant la traversée (Holstensborg)	$+ 0^s,8$	$0^s,0$
— après - — (Angmagsalik)......	$+ 1^s,6$	$+ 0^s,5$
Moyenne sur les côtes	$+ 1^s,2$	$+ 0^s,25$
Marche pendant les 5 premiers jours de la traversée	$+ 0^s,9$	$+ 0^s,1$
Marche pendant les 5 derniers jours de la traversée	$+ 0^s,7$	$+ 0^s,1$
Moyenne	$+ 0^s,8$	$+ 0^s,1$

La différence des marches observées avec les marches supposées se tient donc dans la fraction de la seconde, de même que la reprise de marche après la traversée.

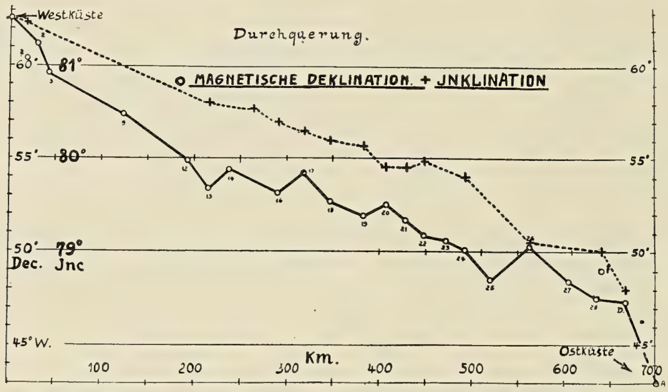
Mesures magnétiques.

Ces mesures se bornent à la détermination de la déclinaison et en deuxième ligne de l'inclinaison. Les mesures de déclinaison devaient servir avant tout au but pratique d'orientation de l'itinéraire pendant toute la durée de la traversée; en plus elles formaient une contribution

utile à la connaissance de la déclinaison dans cette région inconnue jusque là.

Etant donné qu'à ces latitudes boréales la perturbation de la déclinaison est de l'ordre de grandeur du degré d'arc et qu'il était impossible de rapporter nos observations à une station de base, il paraissait suffisant de faire les lectures à 6′ près. Il aurait été illusoire d'aller plus loin.

Les mesures ont été faites à l'aide d'une boussole divisée en degrés et munie d'une aiguille aimantée longue de 60 mm. La boussole s'adaptait



Déclinaison et inclinaison magnètiques en fonction du chemin parcouru.

sur le théodolite »Hildebrand«. Avec celui-ci on déterminait un azimut en visant le soleil successivement dans la position cercle à gauche et cercle à droite, lisant en même temps un chronomètre et marquant la position de l'aiguille après un léger ébranlement. L'azimut a été déduit des tables d'Ebsen en usage chez les marins. L'heure locale étant toujours connue à quelques secondes près, les déterminations de l'azimut et de la déclinaison se faisaient ainsi très aisément.

Le théodolite avec sa boussole a été vérifié après notre retour, le 1 octobre, à l'observatoire magnétique de Rude Skov près Copenhague par M. Hjort et M. Mercanton; la correction de — 0°,15 a été appliquée dans les tableaux suivants.

a) Résultats des mesures de déclinaison.

Si l'on porte les déclinaisons en fonction des distances du point de départ (figure 2) on trouve une forte décroissance du nord-ouest vers le sudest, d'autant plus prononcée, que notre itinéraire qui, par hasard, correspondait à peu près au méridien magnétique, était à peu près perpendiculaire aux lignes d'égale déclinaison. Cette décroissance montre des irrégularités qui dépassent de beaucoup les erreurs de mesure. D'abord la décroissance est plus forte à l'ouest qu'à l'est,

D'autres irrégularités doivent être attribuées à des influences locales, c'est à dire, aux propriétés des couches géologiques qui se trouvent sous l'inlandsis, soit que ces parties aient des altitudes différentes, soit que la nature des roches varie. On peut penser à des alternances de basalte et de gneis.

Des voyages futurs sur l'inlandsis, une fois les difficultés techniques de tels voyages vaincues, pourront étudier ces problèmes avec plus de facilité.

b) Mesures d'inclinaison.

Ces mesures ont été faites avec une aiguille d'inclinaison de 10 cm, construite sur les indications de Mr. Mercanton. Cet instrument s'installait sur le théodolite Hildebrand, comme la boussole. Il a été lu à chaque observation 5 fois dans deux positions opposées du cercle. Les données qui se trouvent dans notre tableau et dans la figure 2, se rapportent surtout à la seconde partie de la traversée. Les premières mesures n'ayant pas été exécutées d'une façon irréprochable, je les ai laissées de côté. La réduction a été faite par Mr. Mercanton, après une vérification très exacte des instruments. Il indique pour l'incertitude des mesures $\pm 3'$.

La décroissance de l'inclinaison de la côte est en général parallèle à celle de la déclinaison. A 5 degrés de décroissance de la déclinaison correspond assez exactement 1 degré d'inclinaison. Nous remarquons de 200 à 500 km que la variation tend cependant à une augmentation passagère.

Mesure des distances.

La détermination des distances devait se faire avant tout par les mesures astronomiques. Celles-ci dépendaient du temps plus ou moins favorable. On a donc prévu d'autres méthodes complémentaires, savoir: en dehors des observations, par une roue, qui enregistrait les distances (»Sledgemeter«) et plusieurs compteurs de pas. Le sledgemeter consistait en une roue en alliage de nickel ne rouillant pas; le diamètre était de 60 cm et la largeur de la jante de 4 cm, munie d'un certain nombre de pointes qui émergeaient de 2 à 3 mm. Le chemin parcouru se lisait à un compteur allant jusqu'à 20 km et qui permettait d'estimer encore tout juste les mètres. Une vérification que nous avons faite sur une neige dure, sur une distance de 1000 m, m'a donné une erreur plus petite que 1 ‰, aussi bien pour une avance lente, qu'une avance plus rapide, jusqu'à 5 m à la seconde. Plus tard nous avons constaté que les distances indiquées sont sensiblement trop petites, quand la position de la roue n'est pas bien verticale; de même quand le chemin se faisait dans la neige molle, mais aussi quand la neige était très poudreuse.

Tableau des coordonnées astronomiques de la traversée et des déclinaisons et inclinaisons magnètiques.

Date	Lieu	Altitude au dessus de la mer.	Coordonnées		Magnétisme	
			Latitude	Longitude	Déclinaison	Inclinaison
		m				
8—9 juin	Jakobshavn[1])	5	69°13′04″	51° 6′0″	—	81°45′
11 —	Q-havn[2])	5	69 45 19	50 15 2	62°6′	81 32
	Q-havn[3])	—	69 45 48	—	—	—
	Bord de l'inlandsis	—	(69 44 00)	(50 07 8)	—	—
21 —	camp 1	789	69 41 04	—	60 3	81 27
22 —	— 2	979	69 38 33	49 37 9	61 2	—
23 —	— 3[4])	1120	69 35 23	—	59 6	—
24 —	— 4	1172	69 33 41	49 12 0	—	—
25 —	— 5	1275	69 28 38	48 48 2	—	—
26 —	— 6	1344	69 23 24	—	—	—
27 —	entre c. 6 et c. 7	—	69 20 17	—	—	—
27 —	camp 7	1397	(69 17 09)	—	—	—
28 —	— 8	1498	—	—	—	—
29 —	entre c. 8 et c. 9	—	69 11 35	—	—	—
29 —	camp 9	1641	(69 08 02)	47 25 0	57 4	—
30 —	entre c. 9 et c. 10	—	69 06 25	—	—	—
1 juillet	camp 10	1750	—	—	—	—
2 —	— 11	1831	—	—	—	—
2 —	entre c. 11 et c. 12	—	68 55 00	—	—	—
3 —	camp 12	1888	68 49 10	46 12 9	54 9	—
4 —	— 13	1936	68 41 14	45 44 9	53 4	—
5 —	— 14	2046	68 34 02	45 16 4	54 4	80 36
6 —	— 15	2176	—	—	—	80 33
7 —	— 16	2243	68 15 05	—	53 2	80 24
8 —	— 16	—	—	44 15 7	—	—
9 —	— 17	2318	(68 06 00)	—	54 2	80 18
9 —	entre c. 17 et c. 18	—	68 04 32	—	—	—
10 —	camp 18	2399	(67 54 01)	(43 15 2)	52 7	80 13
10 —	entre c. 18 et c. 19	—	67 53 09	—	—	—
	camp 19	2457	(67 42 03)	—	51 9	80 07
11 —	entre c. 19 et c. 20	—	67 41 17	—	—	—
12 —	camp 20	2491	—	—	52 5	79 55
13 —	— 21	2501	—	—	51 7	79 55
14 —	— 22	2432	(67 16 00)	41 34 1	50 8	79 57
15 —	— 23	2258	67 04 34	—	50 6	—
16 —	— 24	2254	(66 58 04)	40 52 4	50 1	79 47
16 —	entre c. 24 et c. 25	—	66 57 35	—	—	—
17 —	camp 25	2084	66 46 49	40 21 9	48 5	—
18 —	— 26	1816	66 29 57	39 43 9	50 3	79 06
19 —	— 27	1465	66 14 45	(38 58 5)	48 4	—
20 —[5])	— 28	1236	66 04 19	38 {27 6 / 28 3}	47 5	—
21 —	— 29	822	66 01 46	(38 12 7)	49 0	79 01
27 —	— 29	—	—	—	—	—
30 —[6])	depôt côte est	36	65 55 18	37 52 8	47 3	78 36
4 août	—	—	—	—	—	—
6 — [7])	Angmagsalik	32	65 36 36	37 33 5	43 0	—
15 —	—	—	*65 36 40	—	—	—

Remarques:

1) Position d'après les déterminations du Bestyrer Olsen [sa longitude d'après occultations] nos déterminations le 8. VI 4^h 31 p et le 9 VI 7^h 38 a.

2) Longitude d'après observation à 8^h a. m. et 4^h p. m., concordant à 1^s 4 [calcul avec moyenne des latitudes.

3) Latitude d'après observation de Mercanton avec théodolite „Hildebrand".

4) Latitude avec théodolite trouvée en même temps 69° 35′ 27″.

5) * Geodésiquement depuis le dépôt à la côte, longitude 7^h 12 a.

6) Longitude; moyenne de deux observations le 30. VII 4^h 50 p, et le 4. VIII 9^h 04 a.

7) * Longitude et latitude d'après Amdrup; notre latitude pour le 6.VIII 4^h 10 p et le 15. VIII 7^h 54 a et 4^h 05 p.

Sur la neige dure le fonctionnement est excellent. Par exemple nous avons pu mesurer les subdivisions des distances entre le camp 18 et le camp 24. La distance de ces deux camps s'est trouvée par les observations astronomiques égale à 145,0 km, la distance trouvée avec la roue est de 143,6 km. Ce résultat est très satisfaisant et permet de penser que les distances de camps intercalaires ont l'exactitude de positions astronomiques.

En plus nous avons mesuré les distances avec des compteurs de pas (podomètre). Ils ont fonctionné d'une façon tout à fait satisfaisante, au moins l'un deux, en comptant les pas de ski. Sur les skis on avait marqué un pas normal de 1 m qu'on s'appliquait à maintenir et qui servait de base. Cette méthode a surtout été employée entre le camp 8 et 16 pour les 7 premiers intervalles. On estimait ainsi la distance de 6 à 12 °/₀ trop grande; pour les deux derniers, connaissant déjà les résultats des distances astronomiques et l'erreur commise dans l'estimation, on l'admettait de 3 °/₀ trop petite. — Ce sont, je crois les premières données précises sur les erreurs commises par ces méthodes.

Maintien du grand cercle et détermination de la direction de l'itinéraire.

Dans l'intention de déduire plus tard un profil vertical de l'inlandsis aussi correct que possible, nous nous sommes appliqués à faire notre traversée le mieux possible sur le grand cercle (Orthodrome), la réduction à un profil idéal avec ses incertitudes étant ainsi réduit à un minimum au point de vue de la distance. La différence entre l'orthodrome et la loxodrome (itinéraire de direction constante) n'était que de 1,11 km; la déviation latérale, par rapport au grand cercle, de 14 km. La loxodrome de notre itinéraire formait avec le méridien l'angle nord 50°30′ ouest, alors que le grand cercle formait un angle nord 56°25′ ouest, au point de départ, et 44°57′ au point final, la distance de ces deux points situés au bord de la mer (coordonnées: 50°15,2′ de longitude et 69°45′10″ de latitude) (et 37°52,8′ de longitude et 65°55′18″ de latitude), mesurée sur le grand cercle, comporte 670,98 km.

Comme base de notre carte de traversée nous avons choisi cette

magnifique »Kort over Grönland« à l'échelle 1 : 2000000, éditée en 1906 par la »Commission for Ledelsen af de geologiske og geografiske Undersögelser i Grönland«. Autant que nous pouvons voir c'est une projection azimutale normale, qui conserve les distances au centre; les déformations sont encore très petites pour la région de notre traversée. Mesuré sur cette carte, le grand cercle ne dévie de la ligne droite dans la direction de la traversée, que de 0,8 mm (vers le sud-ouest); il peut donc être remplacé pratiquement par une ligne droite. La différence de longueur dans la direction de l'itinéraire est égale à 1,014, ce qui correspond à un allongement de 9,7 km. Par suite d'une petite diminution de l'échelle de l'exemplaire dont nous nous sommes servis, cette correction s'est réduite même à 0,4 $^0/_0$, ce que nous avons négligé dans le dessin.

Le maintien de la direction pendant la traversée est basé sur de nombreuses déterminations de la déclinaison. La déviation de l'itinéraire réel du grand cercle (situé en fin de compte de façon à passer par les camps 2 et 29) se tient dans des limites très étroites; comme on peut voir sur la carte de la traversée, planche I, elle ne dépasse pas 13 km.

C'est ici l'occasion de mentionner comment nous avons maintenu la direction d'un camp à l'autre. A part les nombreuses visées avec la boussole, on s'est servi des irrégularités de la surface qui se présentaient successivement à l'horizon; mais ces irrégularités venaient de plus en plus à manquer sur ces plaines infinies. C'est alors qu'on s'est servi de la constance de la direction du vent. Quand le vent a été moins constant ou trop faible, je me suis servi d'une sorte de cadran solaire, que j'avais tracé sur un de mes skis. C'était une rose de traits qui indiquait de 30 en 30 minutes quelle devait être la direction de l'ombre, que mon bâton verticalisé, portait sur le ski pour que ceux-ci se trouvent dans la bonne direction. Au courant de la traversée ce cadre exigeait une correction qu'on pouvait appliquer facilement.

Dans d'autres cas, où un chasse-neige ne permettait pas de rien voir du terrain, pendant des journées entières, et avec des vents inconstants, on essayait de prendre les directions avec une boussole à fluide en tenant compte de la déviation causée par le traîneau sur lequel la boussole était posée. L'observateur signalait alors la direction à prendre à l'homme en tête. De toutes façons, ce dernier ne devait pas s'éloigner beaucoup, à cause du danger très réel de perdre la colonne des traîneaux.

Détermination des altitudes.

La détermination des ordonnées du profil, c'est à dire des altitudes au-dessus de la mer devait se faire avec une exactitude qui correspondait à celle de l'abcisse, donc de la détermination de la position discutée plus haut. Il ne fallait pas perdre de vue l'idée que des mesures comme

celles-ci ne devaient pas seulement constater les conditions actuelles, mais aussi rendre le service bien plus important de fournir à des générations futures la base pour l'examen des variations séculaires ou des changements progressifs. Les mesures postérieures travailleront sans doute avec une exactitude plus grande. La précision d'une détermination pareille des variations dépend donc avant tout de l'exactitude de la première mesure; mais aussi des détails qu'on donne, aux travailleurs qui suivront, sur la méthode employée. C'est pourquoi nous entrons ici un peu dans le détail.

On peut se demander si les méthodes les plus exactes, le nivellement et la mesure trigonométrique, serviront jamais à la fixation de l'altitude de tout un profil d'un inlandsis; mais ce ne paraît pas exclu. Dans notre cas, ce dernier procédé n'a pû être employé que pour la minime partie mesurée par le groupe de l'Ouest. Pour le reste nous étions obligés de nous servir tout d'abord des mesures barométriques. Nous avons employé un appareil hypsométrique, système »Dankelmann«, comme instrument normal, et trois anéroïdes ordinaires, système »Naudet« comme instruments d'interpolation.

a) Détermination du point d'ébullition.

L'appareil hypsométrique consiste en un récipient cylindrique et nickelé de 7 cm de hauteur et 4,2 cm de diamètre avec 80 gr de contenu. Sur ce récipient on pose on tuyau double, haut de 23 cm, avec un diamètre extérieur de 2,5 cm. Il possède une ouverture supérieure, dans laquelle ont peut juste introduire le thermomètre à ébullition. Ce thermomètre est fixé à l'aide d'un anneau en caoutchouc à la hauteur voulue.

Pour la détermination du point d'ébullition on a employé deux thermomètres hypsométriques No. 460 de l'année 1897 et No. 1267 de l'année 1908, ces derniers avec la remarque: »vieilli artificiellement«, les deux de R. Fuess, avec une échelle longue de 18 cm, qui, pour l'intervalle de 450—820 mm donnent directement des indications de pression de 2 en 2 mm de mercure. Un intervalle a une longueur d'environ 1 mm. On a pû en estimer le vingtième, l'œil étant toujours maintenu dans la bonne position à l'aide d'un viseur. Les lectures de pression ont donc été faites à 0,1 mm. L'incertitude d'une mesure ne dépassait pas 0,1—0,2 mm. Dans bien des cas les déterminations faites avec un seul thermomètre ont été considérées comme suffisantes. Chaque jour on a fait ces déterminations en même temps que la lecture de tous les anéroïdes dont les corrections ont par conséquent été déterminées journellement.

Les corrections des hypsomètres ont été déterminées de la façon suivante; avant le voyage pour le No. 460 par la comparaison que

j'avais exécutée avec le baromètre normal du bureau météorologique de Zürich, et d'un autre côté avec le baromètre contrôlé de l'observatoire du Saentis; le No. 1267 a été vérifié avant l'expédition de 50 à 50 mm par la Physikalisch-Technische Reichsanstalt à Charlottenburg. Après le retour, les deux hypsomètres ont été vérifiés de nouveau par ce dernier institut. A cette occasion, il fût constaté qu'une trace de mercure avait distillé dans le haut du tube capillaire. Une série a été faite dans cette condition, deux autres après que le mercure distillé ent été de nouveau réuni au reste. La différence était de 0,2 mm. On a appliqué pour la réduction de nos observations de la traversée les résultats de la première série, parce qu'ils correspondaient le mieux avec les déterminations faites par moi-même immédiatement avant le départ.

Nous avons pû constater pendant le voyage que dans les cas oû l'on a comparé les deux hypsomètres entre eux, les différences n'ont dépassé un dixième de mm pour les faire s'accorder avec les valeurs de correction indiquées plus haut. On peut admettre que l'incertitude des déterminations de la pression ne dépasse pas $\pm$ 0,2 mm dans chaque cas.

Les mesures faites avec les anéroïdes.

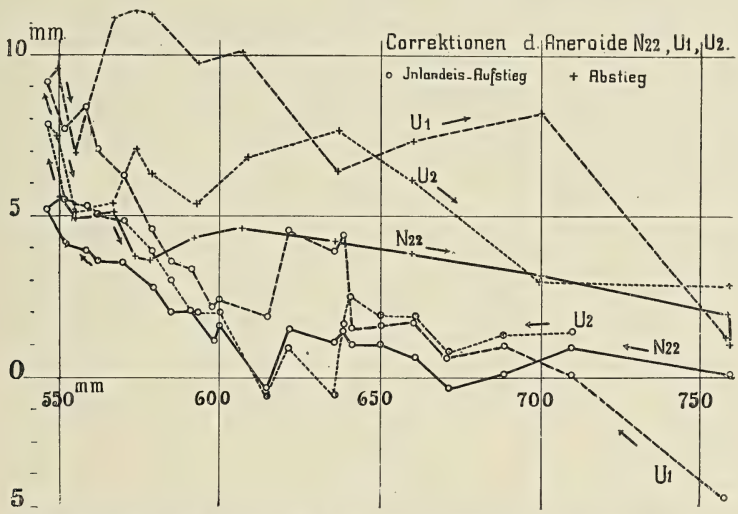
Les trois anéroïdes étaient des instruments à aiguille de Naudet avec cadran de dix cm pour le grand instrument et une échelle allant jusqu'à 3500 m, alors que le cadran avait un diamètre de $6^1/_2$ cm aux 2 petits instruments qui allaient à 4200 m; ces derniers instruments avaient sur le couvercle une loupe pour mieux lire la division un peu serrée. Les trois instruments étaient désignés comme étant compensés, mais ils possédaient tout de même un thermomètre attaché qui a été lu en même temps que la pression. L'expérience avait montré bientôt que le grand instrument fonctionnait mieux et était moins sujet au retard d'élasticité, de sorte qu'il servait de préférence d'instrument d'interpolation. Les deux autres anéroides servaient comme réserve et pour faire des reconnaissances.

Correction et retards des anéroïdes.

Il sera rare que des instruments pourront être étudiés en voyage dans des conditions aussı régulières d'augmentation et de diminution de la pression. C'est pourquoi nous avons étudié de plus près leur manière de se comporter. Quand on compare les corrections qui ont été trouvées sur l'inlandsis dans la partie ascendante et déscendante de la traversée, on sera étonnée de la grandeur du retard et de même de voir combien ces instruments, qui sont pourtant de construction identique, diffèrent sous ce rapport. Dans l'instrument N 22 ce retard est de 3 mm au maximum, dans U 2 le retard est de 5—6 mm, dans l'instrument U 1

il atteint 8 mm. Le premier instrument a déjà été acheté en 1909, les deux derniers ont été achetés en 1912.

Comparons maintenant les corrections qui ont été trouvées, par la méthode hypsométrique sur l'inlandsis même dans une montée très lente de 3 semaines, avec les corrections trouvées dans les Alpes et de même la vérification sous la machine pneumatique; nous serons étonnés de voir que même la comparaison dans les Alpes, malgré une attente de deux jours, aux altitudes où la lecture a été faite, est encore très



Différences des corrections des anéroïdes à la montée et à la descente sur l'inlandsis.

éloignée d'indiquer l'équilibre définitif de l'anéroïde; il reste encore de 4—8 mm au-dessous de l'adaptation que l'instrument a pris sur l'inlandsis. On voit combien il est nécessaire de se préserver de toutes ces influences par des mesures de contrôle aussi fréquentes que possible.

La vérification de la compensation a été faite, avant le voyage, à la pression de Davos (1500 m) et sur le Saentis et donne les résultats suivants:

N 22	$c = t—t\,(0{,}437 — 0{,}00064p)$	Pression de compensation	675 mm
U 1	$c = t—t\,(0{,}436 — 0{,}00047p)$	— - —	927 mm
U 2	$c = t—t\,(0{,}335 — 0{,}00034p)$	— - —	982 mm
U 3	$c = t—t\,(0{,}376 — 0{,}00058p)$	— - —	647 mm

Nous avons tenu compte de cette variation de la compensation avec la pression qu'on néglige presque toujours parce qu'on l'ignore.

b) Calcul de la hauteur.

Ces déterminations, comme toutes les mesures barométriques d'altitude, possèdent surtout trois sources d'erreur: en premier lieu l'erreur

de la mesure de pression à la station d'altitude et à la base choisie, secondement l'incertitude sur la température de l'air qu'il faut employer pour ce calcul, et en troisième lieu l'incertitude sur le gradient de pression horizontal. La seconde et la troisième source d'erreurs ont dans notre cas une influence considérablement plus grande que la première; mais on peut dire pour toutes les trois que par le choix du profil elles ont été réduites au minimum qui est possible pour les conditions d'un pareil profil d'inlandsis.

Nous avons déjà parlé de l'exactitude des mesures de pression pendant la traversée. Il a été important pour l'homogénéité des résultats, que j'aie pu vérifier moi-même les corrections dans les stations de base: Jakobshavn et Angmagsalik. Ces corrections se sont du reste trouvées identiques avec celles déterminées par l'Institut Météorologique Danois lui-même, autrefois.

Les lectures faites à ces deux stations pendant la traversée ont servi comme base. Nous avons pu avoir toute confiance dans l'exactitude des deux observateurs Bestyrer Olsen et Petersen. Les barographes installés aux deux stations pouvaient du reste servir de contrôle. Le fait que ces deux stations se trouvaient relativement près de notre point d'arrivée et de notre point de départ, représentait le cas le plus favorable aussi bien pour la détermination de la température moyenne de l'air qu'il fallait appliquer, que pour la détermination du gradient horizontal le plus probable. Il est vrai que pour ce dernier but nous avons tâché de dresser des cartes de pression de toute la région; mais dans ces cartes ces deux stations déterminaient pourtant avant tout la façon dont on établissait les isobares. Les cartes dont nous parlons et qui avaient pour base tout le matériel accessible, ont été mises à notre disposition par M. le directeur Carl Ryder † suivant un vœu de la Commission Internationale Aérologique, présidée par l'amiral Rykatchev.

Les altitudes sur l'inlandsis, avant tout les altitudes des camps, ont été calculées de la façon suivante: il s'est trouvé que deux des trois observations journalières qui concordaient avec les stations de base, tombaient dans la durée de séjour en un camp. Le plus souvent c'était le terme du soir (9^h) et le terme du matin (8^h). A l'occasion de l'un ou de l'autre on a toujours fait une détermination absolue de la pression. Pour l'autre terme, on a appliqué la correction trouvée par l'anéroide douze heures avant ou après. On peut admettre que cette correction a très peu varié dans cet intervalle de temps; toutefois ces pressions seront un peu moins exactes, leur incertitude sera peut-être de 0,3 à 0,5 mm. Quand les heures d'observations sur l'inlandsis différaient notablement, la pression de la station de base a été réduite avec le barographe. On a donc pu calculer les hauteurs de tous les camps par deux mesures et pour quelques-uns par trois àng a observations. Une

certaine partie des erreurs de température et de gradient se compenseront de cette façon.

Les altitudes de la première partie de la traversée jusqu'à la hauteur maxima ont été réduites sur Jakobshavn. Les camps 18—21 ont été réduits d'après les températures des deux stations de base.

Les altitudes ont été calculées d'après la table altimétrique d'Angot, rééditée par nous en 1904.

$$X = 18400 \log \text{vulg} \frac{p_0}{p} \cdot (1 + 0{,}00366\, t_m) \cdot (1 + 0{,}377\, E) \cdot \left(1 + k \frac{z_1 + z_2}{2R}\right. \cdot (+ 0{,}0026 \cos 2\varphi)$$

Les trois derniers termes sont dans notre cas sans importance. Pour les stations de base la correction de gravité était naturellement appliquée d'avance.

L'influence de l'heure de la journée sur les altitudes ne peut être indiquée avec certitude, mais en général les deux termes employés sont très voisins de la moyenne diurne; en plus ils ne sont pas très éloignés des deux heures pour lesquelles on trouve dans les Alpes pour les mesures altimétriques d'été le minimum d'erreurs.

L'influence du gradient horizontal.

Les cartes de pression que nous avons mentionnées donnent une assez grande clarté sur la répartition de la pression à la côte de l'ouest et de l'est du Groenland et permettaient une interpolation assez probable pour les points successifs de la traversée. Pour chaque terme on a effectué le calcul de hauteur, d'abord avec les pressions de l'une ou de l'autre des stations de base, et ensuite on a ajouté une correction de gradient, découlant immédiatement de la supposition d'une pression interpolée fictive au niveau de la mer au-dessous du point en question sur l'inlandsis.

Dans la plupart des cas cette pression fictive n'était pas autre chose qu'une valeur interpolée entre les pressions de Jakobshavn à Angmagsalik. Cependant on a tenu compte aussi des gradients existant aux deux côtes et de la direction du vent sur l'inlandsis lui-même, en plus de la tendance probable d'une plus haute pression sur l'inlandsis. Dans quelle mesure cette tendance existe sur ce dernier. C'est affaire d'appréciation, il ne pouvait guère s'agir d'autre chose que de la question s'il fallait, dans certain cas, augmenter la pression de base d'un mm ou d'un demi mm seulement.

Détermination des altitudes entre les camps.

Entre tous les camps on a fait de temps en temps des lectures du grand anéroide à des points dont la distance des camps était suffisamment connue par une des méthodes décrites. Ces lectures d'altitudes ont été interpolées plus tard entre les hauteurs calculées pour les camps,

en tenant compte de la variation probable de la pression. On a aussi tenu compte du relief du terrain, en employant les mesures d'inclinaison de la surface et toutes les autres notes de détail sur l'aspect du terrain.

Il y a lieu de remarquer qu'il faut être très prudent dans les estimations de pente ou de contre-pente sur l'inlandsis. J'en avais fait l'expérience en 1909 dans la région du grand Karajak. On est exposé aux plus grandes illusions, en surestimant ces pentes quand on les voit de loin.

Topographie de la surface le long de l'itinéraire.

Déjà lors de notre première expédition sur l'inlandsis en 1909, je m'étais dit, que dans une traversée future, il ne faudrait pas se contenter d'un simple profil, mais qu'on devrait tendre à représenter en quelque sorte un ruban de surface. Une bande pareille devait, aussi mince qu'elle soit, faire voir en chaque point de l'itinéraire la surface tangentielle et par là les grands traits généraux de la topographie.

Ce ruban qui est un résultat essentiel de notre traversée est représenté pour notre traversée sur la planche I à l'échelle 1 : 1,000,000. Pour la construire on s'est servi des mesures d'altitude déjà mentionnées, et avant tout des mesures de l'angle de hauteur de l'hor izon, exécutées avec le théodolite, à chaque camp, dans 8 directions au moins. De même je me suis servi, surtout en route, d'un petit dispositif qui permettait d'employer, comme instrument à niveler, nos jumelles à prisme, avec une exactitude d'environ 1 ‰. Chaque fois qu'on faisait une de ces visées de l'horizon d'un point quelquonque, on en a estimé la distance. Toutes ces estimations étaient sujettes à des erreurs, du reste diminuées par l'expérience que nous possédions. En général nous croyons pouvoir répondre des grands traits dans l'inclination des surfaces tel que nous les avons représentés sur notre carte. On verra surtout que pour de très grandes régions ces déterminations locales faites d'un camp à l'autre se fondent en une harmonie qui signifie une confirmation intérieure de notre procédé.

Il mènerait beaucoup trop loin de donner, dans cette publication concentrée, tout le matérial sur lequel se base la carte de ce ruban; du reste bien des détails de la situation topographique m'étaient encore présents en 1913, quand je dressais cette carte, — des détails qui quelquefois se trouvent à peine dans les notes. Nous donnons ici au moins un exemple d'une de ces mesures faites à un de ces camps.

Mesure de l'horizon au camp no. 13.

Azimut astron.	magnét	Horizon Dist. estimée en km	Dist. zénithale
N	55°	4,0	89°38′0
NE	100	2,0	42 0
ca. E	150	2,0	48 0
direction de l'itinéraire en avant	183	3,0	54 0
SE	190	0,8	54 5
S	235	1,5	90 5 0
SW	280	3,0	0 5
W	325	3,0	6 5
direct. de l'itinéraire en arrière	363	3,0	6 0
NW	365	3,0	6 0

Remarque:

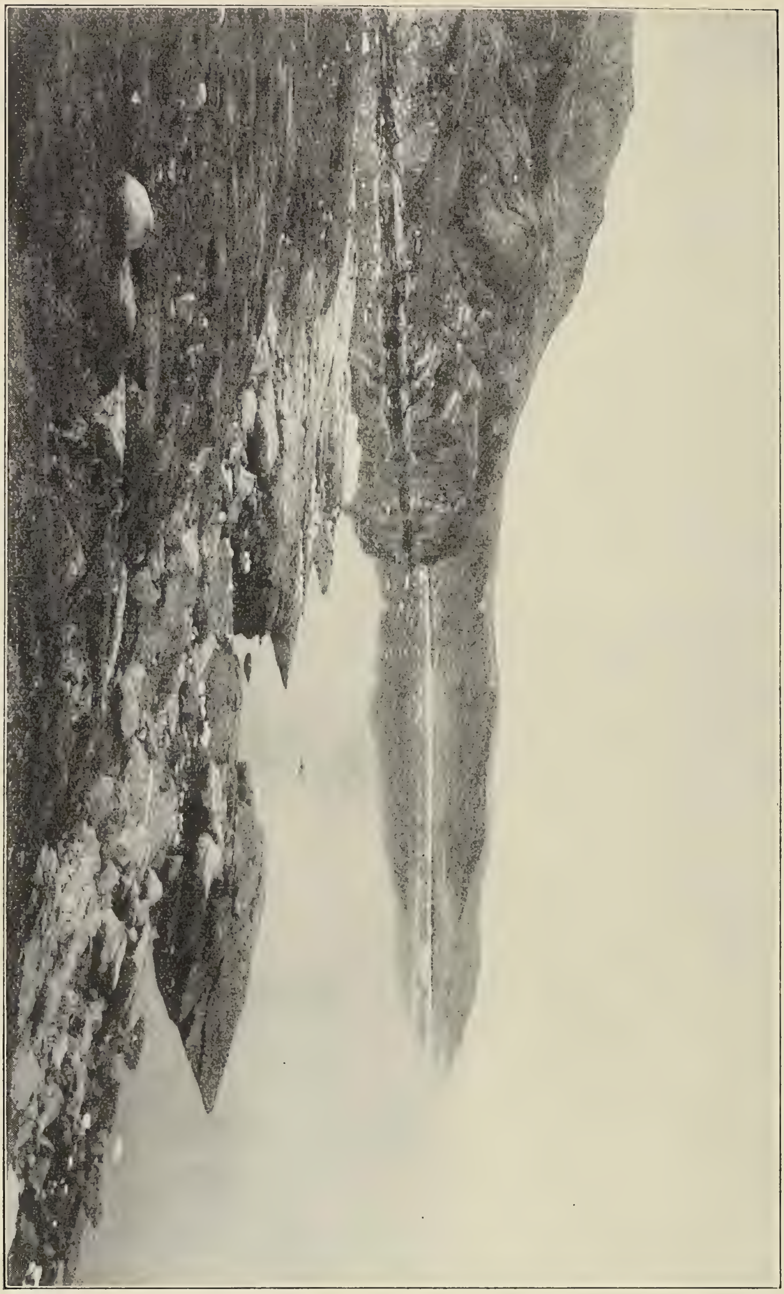
La direction exacte de l'est a été cachée par la tente, on a donc mesuré 5° vers le S. L'horizon a été un peu brumeux, de là les variations dans l'estimation de la distance.

Il faut encore mentionner l'influence de la réfraction terrestre sur les angles de hauteur mesurés à l'horizon. Nos mesures météorologiques prouvent que le mouvement de l'air n'a jamais permis une différence de température entre la surface et l'air qui aurait atteint plus de 1 à 2 degrés. Même si cette différence atteignait 5°, l'erreur d'une mesure à l'horizon ne dépasserait pas 2′ d'arc.

Réduction du profil de la traversée à un profil idéal.

La réduction au profil idéal peut être faite avec une assez grande approximation parce que les positions réelles des camps s'en approchent déjà beaucoup. Le profil idéal était choisi de façon qu'il coupait le second camp, ne comportait aucune correction dans le point le plus élevé et passait par le dernier camp (29) au bord de l'inlandsis. Alors que la déviation latérale des points réels de la traversée est de 4 km en moyenne, la déviation la plus grande (camp 26) était de 13 km.

Les corrections d'altitude nécessaires pour réduire notre itinéraire au profil idéal pouvaient être puisées sans autre dans notre ruban d'isohypses de la traversée, abstraction faite des 2 premiers et des deux derniers camps où la situation est plus compliquée et les réductions incertaines. La déviation moyenne des hauteurs est de 7 m, la valeur maxima (camp 24) est de 22 m. On peut admettre que ces valeurs sont exactes à $^1/_3$ ou $^1/_4$ de leur propre valeur. Leur valeur absolue est comme on voit très petite. On la trouve pour chaque camp dans le tableau ci-contre. Nous devons mentionner ici une certaine différence entre les hauteurs des camps utilisées dans le ruban d'isohypses (planche I), et



Port-Quervain, baie de Nadlùarsuk, Grönland W.; du campement.

Phot. Jost avril 1912.

les altitudes barométriques définitivement utilisées pour le profil d'altitude lui-même. J'ai dû exécuter le dessin du ruban d'isohypses avant de posséder toutes les corrections pour les altitudes définitives (cartes synoptiques). Les différences ne m'ont pas semblé assez importantes pour refaire tout le dessin; leur indication dans le tableau

à côté pourrait suffire. Dans le dessin du profil vertical, on les trouve du reste marquées dans les cas où la différence est un peu plus grande.

Eclaircissements topographiques spéciaux.

Explication des horizons observés dans la partie ouest de la traversée et figurés dans le tableau no. 4.

La topographie de la zône rocheuse entre la mer et la partie de l'inlandsis où a commencé notre traversée est décrite par le professeur

Tableau général des inclinaisons de la surface le long de l'itinéraire, en %.

Camp	Altitude au dessus de la mer m.	Inclinaison de l'horizou dans la direction.								Correction d'altitude d.l. carte d'isohyps. m.	Réduction des altitudes à un profil ideal. m.
		N.	NW.	E.	SE.	S.	SW.	W.	NW.		
1	789	—5,3	+12,4	+24,8	ca.20	10	0,3	5,6	—3,5	0	20
2	979	—3	12	22	20	3	—5,5	—12	—9	11	0
3	1120	5	20	15	8	6	—10	—16	—9	0	0
4	1172	7	14	22	15	14	8	3	8	2	5
5	1275	22	24	18	20	1	—1	6	5	7	—8
6	1344	9	15	13	13	6	—9	—11	—2	—6	—10
7	1397	20	40	40	10	0	—5	—5	0	—31	—8
8	1498	7	18	13	12	5	—2	—4	2	4	—2
9	1641	4	6	6	0	—4	—5	—7	—5	—1	—17
10	1750	9	16	23	11	—1	—5	—9	—1	22	—7
11	1831	1	9	10	5	6	10	5	2	11	8
12	1888	8	15	11	10	9	9	2	3	10	0
13	1936	6	5	4	1	—1	0	—2	—2	—13	0
14	2046	5	5	7	8	2	1	—2	1	6	15
15	2176	5	—	4	5	2	—1	—5	—1	5	—1
16	2243	—1	4	5	4	2	—2	—2	—3	23	—10
17	2318	0	3	5	3	2	0	—2	—2	28	—6
18	2399	0	2	3	2	—1	—2	—3	—3	9	—8
19	2457	—1	2	3	2	1	—1	—3	—3	—3	—2
20	2491	0	1	1,5	1	1	—1	—1	—1	0	1
21	2501	1	—1	—2	—2,5	—2	—1	1	2	11	—1
22	2432	—	—	—	—3,5	—4	—	—	—	—42	4
23	2258	10	5	0	—1	—1,5	+1?	4	10	—32	15
24	2254	2	3,5	3,5	—1	—5	—4	2	1,5	—6	22
24 a	—	8	—1	—4	—6	—3	0	6	10	—	—
25	2084	7	1	—4	—5,5	—2,5	4,5	12,5	13,5	4	10
26	1816	5	—0,5	—5,5	—7	2,5	6	9,5	7	—24	—10
27	1465	—1,5	—8	—7	1,5	10,5	18	13,5	5,5	—15	—70
28	1236	31,5	9	—17	—40	—3	6	21,5	36,5	—4	10
29	822	52	54	3,5	0	Moräne		50 34	41	0	0

Mercanton; nous parlerons ici seulement de l'aspect de la partie vue depuis l'inlandsis. »La terre« c'est à dire les montagnes ou rochers de la côte n'étaient visible qu'aux trois premiers camps. Il n'y a pas d'aspects extraordinaires, mais ces esquisses simples de l'horizon sont tout à fait caractéristiques et auront leur intérêt pour plus tard, quand on voudra retrouver ces positions, sans déterminations astronomiques.

Depuis le premier camp (planche IV, fig. 1) on aperçoit la terre qui est dans la direction de NW à NNW, dans la direction du fjord de Torsùkatak. Même les points *b* et *c* correspondent probablement au plus grandes élévations du Nùnap Kigdlingâ, désigné plus tard par le Groupe Ouest comme Söndagsfjeld et Frysefjeld et porté dans la carte spéciale planche III. La masse noire (*g* et *h*) correspond probablement au nounatak d'Ilùlialik, les autres montagnes à dos plat se trouvent probablement plus loin au bord droit du Torsùkatak, les plus près jusqu'à la région qui s'appelle Iviangernat dans la carte danoise. Les azimuts astronomiques (comptés à partir du N vers l'E) sont déterminés avec la boussole du théodolite.

a	b	c	d	e	f	g-h
310°5	311°5	312°0	317°9	322°0	329°4	333°4 — 336°4

Au second camp la vue de la terre est plus étendue. A WSW elle commence avec des rochers aplatis qui doivent appartenir à la région du Pakitsok. Vers l'ouest jusqu'au NW on voit les dômes arrondis de l'île de Disco. Plus près nous voyons les masses rocheuses au S du Nùnap Kigdlingâ et du Sermerk Kùjadlek. Les deux têtes vers NW paraissent plus rapprochées et appartiennent peut-être à la terre de Ana, plus au loin on voit le haut-plateau de Nùgsuak.

Nous attirons encore l'attention sur une dent de montagne qui dépasse à peine l'horizon vers le NNW, mais très marquée. Déjà sur ce point j'avais l'idée qu'il pourrait s'agir de la région très éloignée du Karajak, où le sommet du »Ainùk« s'élevait comme pointe isolée, gravi en 1909 par le Dr. Bäbler et par moi. Nous avons alors cru que notre regard s'étendait au S jusqu'à la région de Torsùkatak. D'après la carte danoise la direction de l'Ainùk serait 339°; notre observation a donné 340,5° ce qu'on peut considérer comme une bonne confirmation, étant donné l'incertitude de la carte. La distance est environ 110 km. La terre qui se trouve à droite de l'Ainùk pourrait correspondre au »Renntier-Nùnatak«. Voici les azimuts de quelques-uns de ces points.

Point:	14	15	16	18	1	2 (Ainùk)	3
Az.	254°	260°	281°	311°	325°	340°5	344°

Depuis le camp No. 3 nous voyons la terre pour la dernière fois, dans la direction WSW (Pakitsok) (entre le camp 2 et le camp 3, on

avait vu dans cet abaissement du côté de Pakitsok, la surface de la mer elle-même sur laquelle on voyait reluire le reflet du soleil). A droite nous voyons de nouveau les névés de Disco et plus près les terres d'où sort la rivière de Kùgsùak. Au nord deux têtes rocheuses affleurent l'horizon, c'est la direction de Torsùkatak.

Point:	14	15	17	1
Az.......	249°	265°5	284°	309°

Intersection de l'itinéraire avec ceux de A. E. de Nordenskjöld 1883 et de R. E. Peary 1886.

Notre itinéraire coupait deux autres itinéraires sur l'inlandsis, devenus historiques, lesquels, à part l'expédition de J. A. D. Jensen, sont les premiérs qui nous donnaient des idées exactes sur la nature du bord W de l'inlandsis. Ce sont les itinéraires de R. E. Peary et de son compagnon de voyage Maigaard, en juillet 1883, qui sont partis du fjord de Pakitsok à la latitude de 69°30′, et celui de E. de Nordenskjöld, en juillet 1883, qui est parti à 68°20′ au fjord de Aulatsivik.

Quand nous avons choisi le point de départ de notre traversée, nous avons tâché de tenir compte de l'idée de couper ces deux itinéraires pour en contrôler l'exactitude. Car on sait qu'ils sont en contradiction flagrante pour ce qui concerne le profil de l'inlandsis.

a) Le point d'intersection avec l'itinéraire de Peary.

Notre itinéraire coupait le sien à la latitude indiquée de 69°30′ à 48°5′ de longitude, 4 km en arrière de notre camp 5, à peu près 52 km de notre point de départ au bord de l'inlandsis et à peu près 50 km du point de départ de Peary. Nous avons trouvé pour ce point un altitude de 1290 m. Pour trouver l'altitude correspondante de Peary, il-y-a deux possibilités. On peut se baser sur le profil donné par A. Hansen dans sa publication de la traversée de Nansen. Le profil qu'on y trouve, a une longueur de 168 km jusqu'à la mer et de 155 km à partir de l'altitude de 600 m. (C'est là où d'après Peary l'inlandsis a commencé). La grande carte du Grönland des Danois indique pour cette dernière distance 175 km. Si on réduit sur cette base et celle du profil de Hansen la hauteur du point qui nous intéresse, on trouve 1510 m. Ainsi le profil de Peary serait déjà trop haut de 200 m à ce point là, et on serait tenté d'extrapoler cette erreur pour le reste du profil.

Mais si on se base sur une petite carte donnée par Peary dans sone livre »Northward over the Great Ice«, 1898, vol. I p. 18 on trouve comme altitude du point en question seulement 1275 m, c'est à dire très près de ce que nous avons trouvé.

Nous n'avons pas pu élucider la contradiction entre le profil publié

par Hansen et celui publié par Mr. Peary lui-même, malgré la réponse très aimable que ce dernier a bien voulu nous donner.

b) Le point d'intersection avec l'itinéraire de A. E. de Nordenskjöld et la décision de la question sur le point extrême atteint par ses Lapons.

Nous croyons avoir tranché définitivement la question beaucoup discutée si les Lapons ont vraiment atteint le point extrême qu'ils prétendaient et que Mr. de Nordenskjöld admettait. Qu'il soit dit d'avance que les doutes émis par Mr. Nansen se sont trouvés confirmés.

Le point d'intersection avec le profil Nordenskjöld est à peu près 5 km plus loin que notre camp 13; ses coordonnées sont 68°39′30″ de latitude et 45°39′5″ de longitude ouest. Son altitude, interpolée entre celle du camp 13 et celle d'un point qui est situé 7 km plus loin, est de 1958 m.

C'est presque la même altitude, savoir 1947 m, que les Lapons avaient trouvé comme hauteur maxima, — mais au but de leur excursion en ski situé 115 km plus vers l'est! Pour le point d'intersection le profil de Nordenskjöld indiquait 1720 m seulement.

Admettons avec Nansen que c'est la lecture des Lapons qu'il faut considérer comme digne de confiance. Il ne reste donc pas d'autre conclusion que celle-ci: les Lapons ne sont pas allés plus loin que notre point d'intersection. Même, si l'on y regarde très près, il aurait manqué 6 km. Il faut donc abandonner complètement la partie extrême du profil de Nordenskjöld avec cette plaine invraisemblable, (au moins dans cette étendue; car notre profil a bien indiqué quelque chose comme une plaine dans cette région). Par contre il faut considérer comme très exact le profil de Nordenskjöld jusqu'au point où il a pénétré lui-même.

Les premières montagnes de la côte est sont devenus visibles dans la direction N 83°E le 17 juillet, le soir à 8h40, 7,4 km plus loin que le camp 25, à 2062 m au-dessus de la mer, à un point dont les coordonnées sont 66°43′9″ N, et 40°15′ W. C'était la partie gauche d'une région de montagnes du type alpin, qui surgissaient de plus en plus pendant que nous nous approchions du camp 26.

Explication des horizons de la côte de l'est vu depuis l'inlandsis.

a) Le panorama du »Schweizerland«.

Le panorama de la région désignée par nous comme »Schweizerland« a été dessiné par moi-même le 18 juillet au camp 26 avec tout le soin possible d'après l'aspect qu'il offrait dans mes jumelles, agrandissant 8 fois, et en me servant de l'échelle de pourmille des jumelles.

Celles-ci étaient fixées sur un pied. le réseau formé par l'échelle des pourmilles correspondait au réseau que nous tracions sur le papier.

L'essai de faire une photographie est resté sans résultat. La valeur de l'angle horizontal du panorama se trouve constant à quelques pourmilles.

Nous avons mesuré l'azimut et les angles de hauteurs avec le théodolite pour un certain nombres de points (voir le dessin) l'azimut se base sur des visées du soleil et l'heure locale exacte. Son erreur ne peut pas dépasser $\pm 3'$.

La ligne entièrement horizontale qui coupe le pied de la montagne correspond à l'horizon de l'inlandsis. Il descend de la gauche vers la droite de 15′ environ.

Azimut des angles de hauteur des montagnes du »Schweizerland«.

Point	Azimut	Ang. de hauteur	Point	Azimut	Ang. de hauteur
1a. Nounatak de Mercanton	ca. 61°40′	—	5. Rybergs Fjeld	73°46′	—7′15″
1. Nounatak de Gautier	62 57	—8′15″	6. Holms Fjeld	76 19	—7 40
1b. Nounatak de Schröter	ca. 63 30	—	Horizon neigeux	76 19	—19 00
1c. Nunatak de Stolberg et Jost	ca. 64 30	—	7. Daug. Jensens Fjeld	78 25	—12 20
2. Frauenberg	66 55	—4 40	8. Danskernes Fjeld	82 23	—9 15
2a. Meisters Pass	ca. 76 50	—13 00	9. Grönländernes Fjeld	84 1	—16 20
3. Mont Forel	68 21	+4 42	10. Koch & Wegeners Fjeld	86 00	—16 00
Horizon neigeux	68 21	—18 00	11. K. Rasmussens Fjeld	88 47	—16 45
4. Massif de la Société Helvétique des Sciences	71 01	—6 15	12. Mikkelsens Fjeld	89 12	—19 15
			13. Horizon neigeux	88 12	—21 00
			14a. Drygalskis Fjeld	92 40	—21 00
			O. Nordenskjölds Fjeld	104 30	—23 50

Le caractère morphologique du Schweizerland est suffisament visible dans le dessin du panorama lui-même, de sorte que nous nous bornons à quelques mots. Le flanc gauche, Mercantons Nunatak, Gautiers, Schröters, Stolbergs, et Josts Nunataks émergent peu à peu de l'inlandsis. Le point extrême de cette partie, le Frauenberg se détache déjà mieux avec ses parois vers le nord ouest et le sud est. Cette partie gauche de la montagne est séparée de ce qui suit par une entaille très profonde, dont les flancs sont formés par le Frauenberg et le Mont Forel. En observant cette partie dans la lunette j'avais absolument l'impression qu'il s'agisait ici d'une sorte de »Outlet« pour des masses de glace continuant derrière cette chaîne. On pouvait voir avec certitude les glaces qui sortaient de ce passage et qui s'étendaient à gauche et à droite. Du côté droit du massif du Mont Forel on croit voir un second passage de ce type, le »passage des Bernois« encore plus vers la droite. C'est un nouveau massif uniforme qui commence. Le détail est caché par des collines plus rapprochées. Ces collines s'étendent depuis la direction du Mont Forel vers la droite. La chaîne principale

paraît s'éloigner vers la droite. Elle possède des formes très hardies, comme Rybergs et Holms Fjeld et Grönländernes Fjeld. Pris en général, le »Schweizerland« fait l'impression d'une partie très éloignée des Alpes, tel qu'on les voit en hiver. Ceci différencie cette région de celles qui sont situées davantage vers la droite, du côté du fjord Sermilik.

b) L'horizon vu depuis le camp 27.

Nous étions très déçus de ne plus voir du camp 27 que quelques points de la région précitée; en même temps le temps se gâtait d'une heure à l'autre. On a tenu comme visible le Frauenberg, le Mont Forel, la montagne »*b*« et les montagnes 11 et 14, et probablement aussi les cimes 8 et 12. Vers l'est surgit une autre région de montagnes dont la partie droite, surtout les cimes 14, 15 et 16, se trouvent aussi aur le panorama vu du camp 16 et 17, et même du dépôt. Ces montagnes se trouvent déjà du côté gauche de l'intérieur de grand Sermilik, dans la région de Kingorsuak de la carte danoise. Par contre, la région à gauche de la montagne 18 du panorama vu du camp 27, et surtout le »Schweizerland« représente une région encore inconnue.

c) La hauteur du Mont Forel et du Schweizerland.

Les visées faites au camp 26 et au camp 27 permettent pour quelques points la détermination de la position et de la hauteur. On ne perdra pas de vue, que les longueurs très grandes de visée, et les très petits angles de hauteur ne permettent que des résultats approchés. Pour la détermination des points d'intersection, on a utilisé la carte de Kruuse (Medd. om Grønland, XLIX, 1912) à échelle 1 : 500,000, en complétant son réseau vers l'ouest et en tennant compte pour la partie ainsi complétée, de la convergence des méridiens. En plus on a tenu compte du fait, que l'échelle réelle de la carte, pour la région qui nous intéresse, est environ 1 : 510,000. L'influence absolument prépondérante de la courbure de la terre et de la réfraction a été calculée d'après la formule connue $\frac{1-k}{2r} \cdot a^2$, où r signifie le rayon terrestre, »a« la distance et k la coefficient moyen de réfraction 0,13.

On sait que la réfraction est incertaine d'environ 25 % dans un cas isolé; cela ferait $\pm$ 52 m pour le Mont Forel; ceci abstraction faite d'anomalies proprement dites. Or les latitudes boréales sont renommées pour ces anomalies, au moins au niveau de la mer. Il ne paraît donc pas inutile de constater, que dans ce cas spécial, nous n'avons rien pu trouver, ni dans les conditions météorologiques ni dans les mesures d'angle, qui aurait pu faire supposer des anomalies de réfraction. Il régnait un vent léger, la stagnation des masses d'air et le stratification thermique (inversions) paraîssaient exclues ; les angles de hauteur mesurés

à une ou deux heures d'intervalle se confirmaient. Le tableau suivant contient les points considérés certainement ou probablement identifiés.

Les altitudes des parties les plus éloignées du »Schweizerland« sont donc bien plus considérables que nous n'avons admis d'après les premières visées avec la boussole. Cela suppose une hauteur de l'inlandsis de 2700 à 2800 m même dans cette région. Nous donnons en plus un petit tableau de quelques points qui ont été vus seulement depuis le camp 27.

En même nous donnons les sommets qui ont été vus aussi bien au camp 27 qu'au camp 28, et pour lesquels nous pouvons ici déduire les positions et les altitudes.

Comme nous avons déjà remarqué, ces dernières montagnes se trouvent dans la région de Kingorsùak, visitée par Kruuse. Nous supposons que la montagne qui a le plus grand droit à ce nom (qui signifie »grande dent«) correspond à notre sommet no. 16, qui est le plus élevé de cette région, avec 2110 m. Notre carte générale indique ces positions par des cercles, le numéro, et la hauteur. Les hauteurs données déjà par la carte danoise sont marquées par un point. Les horizons vus de l'inlandsis, camp 28 et 29, depuis la place du dépôt, voir planche II, III et IV.

d) L'horizon vu du camp 28, »Fjordblick«.

Cet horizon a été dessiné par Fick, pour le cas, où les photographies seraient insuffisantes, une précaution qui s'est montrée justifiée. La partie de la photographie qui a été conservée, montre que les profils caractéristiques et la répartition des rochers et de glace est bien rendue.

Cet horizon continue celui du camp 27, avec lequel quelques sommets sont encore communs. Au dessus de la ligne uniforme de l'inlandsis qui se présente comme une surface d'eau, nous voyons les montagnes qui se trouvent au delà du fjord du grand Sermilik. A un seul endroit, le fjord, qui est caché partout ailleurs dans la profondeur, devient visible et on voit déjà les cîmes d'Angmagsalik, sans pouvoir deviner qu'il s'agit d'une île. Le fjord qui la sépare et l'embouchure du grand Sermilik sont cachés. A droite on remarque la Petersenbucht, qu'on ne trouve pas sur la carte et que nous avons baptisé du nom du bestyrer d'Angmagsalik. A droite le regard donne dans la direction du cap Tycho Brahe.

Nous attirons encore l'attention sur quelques détails du panorama. La partie gauche de NE à ENE est la région proprement dite de l'inlandsis au N du Sermilik. La montagne 13 a été considérée comme appartenant encore au panorama du camp 26. La lacune correspond

Point[1])	Azimut ducamp 27	Angle de Hauteur d. c. 27.	Distance au		Hauteur au-dessus de la mer		Moyenne
			camp 26 km	camp 27 km	camp 26 m	camp 37 m	
2. Frauenberg....	49°39′	14′00″	139	125	3007	3039	3020
3. Mont Forel....	51 40	23 00	143	128	3447	3441	3440
6. Massif Soc. Helv.	55 39	17 45	143	126	3075	3200	3140
8.?.............	63 56	16 45	121	97	2546	2582	2560
10.?.............	71 43	10 15	123	96	2331	2239	(2285)
11.?.............	67 57	10 45	105	78	2113	2115	2114
12.?.............	71 43	10 15	106	79	2044	2117	(2080)
13.?.............	—	32 30[1])	103	75	2050	2328	—
14...............	92 08	1 00	119	82	2017	1922	1970

[1]) Depuis le camp 28.

Point depuis le camp 2	Azimut	Angle de Hauteur	Point	Azimut	Angle de hauteur
22. (nounatak) ? ...	33°47′	—8′30″	S²-Mont..........	73°50′	+′00″
19. — ..	40 30	—4 45	Mont 18.........	88 18	+0 15
17. — ..	42 03	—12 15	— 16.........	94 18	+2 30
20. — ..	42 36	—3 15	— 15.........	100 40	—6 10
21. (no. 1) ?........	46 25	+7 45	— 23.........	103 58	—9 50

Point (sommet)	Azimut du		Angle de hauteur de		Distance au		Haut. au-dessus de la mer		Moyenne
	camp 27	camp 28	camp 27	camp 28	camp 27 km	camp 28 km	camp 27 m	camp 28 m	
18.......	88°17′	71°49′	0′13″	20′10″	86	67	1980	1942	1960
14.......	92 08	75 20	1 00	24 10	82	62	1949	1930	1940
16.......	94 18	80 31	2 30	24 40	93	71	2122	2099	2110
15.......	100 40	84 21	—6 10	18 45	75	51	1710	1692	1700

à la ramification du fjord qui va vers l'est. Dans la direction ESE, il faut chercher le fjord d'Ikerasak. Les collines qui surgissent au dessus de l'inlandsis vers le SE appartiennent déjà à notre côté du fjord. La partie qui se trouve à droite du Petersenbucht a pu être détaillée d'après une photographie stéréoscopique à grande base. Il faut comparer ici la carte de 1 : 200,000 sur la planche II. Depuis la partie sud du Petersenbucht jusque du côté de notre position, on voit une série de collines successives qui s'abaissent vers la gauche jusqu'à la baie, en formant des dos arrondis, avec inclinaison de 5 à 20°. Ces dos ont de leur côté nord des parois qui tombent dans des sortes de fossés. Dans l'un de ces derniers qui s'ouvre devant la montagne 29 (Angpalartorsùak

Inlandsis E Sermilikfjord; montagnes d'Angmagsalik S Baie Petersen W Inlandsis

H - -H

Panorama pris de la moraine bordière de l'inlandsis; côte E, bivouac 29, 835 m d'alt., 27 VII 1912.

Phot. Q. G.

Inlandsis E Inlandsis

H— —H

Phot. Q. G.

de la carte danoise) contient un énorme glacier qui s'avance vers la mer, avec une pente de 5 à 8°. Les fossés plus rapprochés contiennent aussi des glaciers, mais ce sont guère des effluents de l'inlandsis à leur état actuel. Dans le panorama on voit encore le point 850,985 et les hauteurs de l'inlandsis de 1200 m de notre carte de 1 : 200,000. Les parties qui se trouvent le plus au nord des pentes descendant de l'inlandsis vers la baie ne sont plus visibles. Ici on peut comparer le panorama photographique pris du camp 29. Il est intéressant de voir comment les parties les plus élevées de ces dos sont couvertes d'un névé étendu, qui est sans doute en contact avec l'inlandsis qui s'étend derrière. L'altitude est entre 850 et 1000 m. Déjà en vue de ces névés, je me suis demandé s'il s'agit ici d'une névé qui est en équilibre avec les conditions climatologiques actuelles et qui correspond avec une limite très basse des neiges éternelles, où bien s'il s'agit de masses de glace apportées par l'inlandsis, où bien encore de glaces qui sont des reliquats d'inlandsis qui se maintiennent parcequ'elles existent, mais qui ne se formeraient plus spontanément. Avec cette dernière question nous avons touché le problème de l'inlandsis entier lui-même, auquel nous reviendrons dans la partie météorologique. On a l'impression que ces caps de névé jouent un rôle passif. L'inlandsis lui-même descend sans doute jusque tout à fait au fond de la baie.

Le panorama du campement no. 20.

Moraine du bord de l'inlandsis.)

(Comparer les planches photographiques réproduits dans le texte, et la carte 1:200 000 qui se trouve à la planche II)

Ce panorama a été fait le 28 juillet. Au nord la partie la plus élevée de la moraine frontale (835 m au-dessus de la mer) dont on voit les amas de blocs dans le premier plan. La vue générale est réduite à la moitié de la photographie originale. Nous rendons dans la grandeur originale une partie particulièrement intéressante. A gauche la première petite dent qui émerge au-dessus de l'inlandsis, correspond au sommet no. 15, plus loin jusqu'à SSE se trouve la chaîne de montagne déjà dessinée au camp 28. Au SE on voit une grande partie du grand Sermilik parsemé d'isbergs. Au sud nous notons la montagne 29, déjà de notre côté du fjord et plus loin vers SW la région déjà discutée pour le panorama du camp 28; seulement le direction de vue est changée. En dehors du glacier que nous avons mentionné plus haut et que nous désignons par no. 1, nous voyons s'abaisser dans la baie de Petersen 4 autres glaciers. Le deuxième qui ne descend peut-être pas de l'inlandsis et qui n'atteint peut-être pas tout à fait la mer, est situé entre les masses rocheuses 1020 et 1160. Le troisième, vu entre les roches

1160 et 850, entre lesquels il doit y avoir une vallée considérable. En atteignant la mer ce glacier a à peu près 1 km de large; le 4. glacier atteint la mer à droite au dessous du point 850. Il est large d'environ 2 km. Les deux glaciers qui sont plus au nord, sont probablement les plus puissants. Celui qui se trouve tout à fait au nord séparé du no. 5 par un nounatak est celui, dont les crevasses nous avaient menacé, quand nous avions fait le chemin du camp 28 au camp 29. Ces deux derniers glaciers produisent des isbergs. D'après mon souvenir les glaciers occupent encore une partie du fjord lui-même. Mais dans cette partie de la baie il y avait encore le 23 juillet, et d'après la photographie aussi le 28 juillet, tellement de glace formée sur la baie elle-même, que la distinction n'était pas très certaine à grande distance. Au S de notre point s'étend le »Gauleberg«, un dos long de 16 km et tout à fait arrondi par l'inlandsis dans ses grandes formes. Depuis l'inlandsis un grand névé secondaire, formé par la neige ramassée par les tempêtes de föhn y descend, et forme un glacier parasite, anémogène, qui descend à droite jusqu'à la Petersenbucht. Vers le SSE on remarque dans le premier plan un rocher noir (la couleur est due à la »hornblende«, qui le compose). Cette formation a quelque chose de typique. Déjà en 1909 j'avais remarqué, au bord W de l'inlandsis, de semblables mamelons formés de hornblende qui surmontaient comme des monticules, la surface de gneis, comme s'ils avaient offert une plus grande résistance à l'érosion glaciaire. Plus à gauche, vers le SE on voit le sommet, couvert de neige, du »Fickberg«, et plus loin vers le fjord le »Hösslyberg«. C'est sur la pente de ce dernier, à peu près dans la direction de la montagne très éloignée, no. 25 qu'il faut chercher le point de vue du panorama suivant.

Le panorama pris de la base I. au-dessus du dépôt, vers le bord droit du Sermilikfjord et le panorama depuis le dépôt.

(Voir les planches photographiques A. et B. du texte, et les cartes à 1:200 000 et 1:500 000 des planches II et III.)

Ce panorama a été fait de la colline au-dessus du dépôt, à 245 m au-dessus de la mer, le 3 août, par mes camarades Fick, Gaule et Hössly, d'après mes indications.

Ce panorama a un intérêt morphologique considérable; son interprétation a été facilitée par des vues stéréoscopiques à grande base, qui m'ont servi pour la disposition suivante. Nous prions le lecteur d'utiliser les panoramas du camp 28 et du dépôt (planche IV et la vue générale de la table photographique B ainsi que le détail donné dans A).

Nous commencons par résumer le caractère général très plastique: C'est à dire, le contraste très exprimé entre les formes absolument arrondies qui longent le bord opposé du fjord, jusqu'à une hauteur

LIX.

Panorama du campement No. 29; côte orientale.

d'environ 800 m et tout cet horizon qui est au-dessus de sommets et de crêtes aigues et pointues. On ne pourrait pas exprimer d'une façon plus effective que l'érosion a travaillé ici avec deux outils absolument différents.

Nous passons à l'identification de quelques points, en commençant au NE (planche photographique, et dessin planche IV) avec la montagne no. 15 (670 m) qui ouvre l'horizon éloigné. Derrière cette montagne il y a encore des sommets et des chaînes bien plus éloignées, qui s'étendent jusqu'au groupe 30 à droite. A gauche de la montagne 30 on a deviné la montagne 16, appelée par nous Kingorsùak. Nous trouvons un dérangement étonnant des formes arrondies du bord opposé du fjord, devant la montagne 31.

Nous voyons qu'une vallée perce d'une façon très brutale ces collines arrondies et c'est précisément le versant opposé au nord qui est dessiné d'une façon très prononcée. Il est singulier de trouver ces formes qui paraissent plus jeunes encore que les jeunes formes d'érosion glaciaire. On ne trouve pas ici la possibilité pour la formation de ces formes postglaciaires comme on les rencontre par exemple dans les Alpes et sur le Plateau suisse.

La forme du sommet 31 (1170 m) évoque la discussion à cause de sa forme tabulaire, différente de toutes les autres; on pourrait penser à un changement de la nature du rocher.

Peu à droite dans la direction de la montagne 24 une chaîne de montagne dont la grandeur paraît très raccourcie par la perspective, court droit vers le fjord. Ce sont 3 sommets principaux, noirs, qui sortent du névé qui couvre leur flanc. La montagne 24 identifiée plus haut se trouve beaucoup plus en arrière.

La chaîne 32 (1330) est située au bord NE du fjord invisible de Ikerasarsùak qui sépare l'île d'Angmagsalik du continent. La chaîne 33 à 34 avec les sommets 1110 et 1050 m se trouvent déjà sur cette île. On peut l'identifier avec certitude sur la carte de Kruuse.

Au point de vue de la morphologie glaciaire cette chaîne est très intéressante, de même la vallée qui longue cette chaîne plus à droite. Nous avons pu voir d'une façon très frappante de notre photographie stéréoscopique à grande base, même à une distance de 20 km, combien la partie de cette chaîne, dirigée vers le fjord d'Ikerasarsùak est absolument arrondie et usée (le fait avait déjà frappé le botaniste Kruuse). Il faut comparer le dessin fait depuis le dépôt et reproduit à la planche IV. J'ai constaté des »montagnes à épaule« analogues à la côte ouest près de Sukkertoppen; voir aussi le Hjortetakken. La vallée qui se trouve à droite de la chaîne de montagnes fait voir elle aussi avec une très grande netteté, la forme qu'on désigne comme »anglo«, avec son épaule qui est marquée par une série de champs de neige. La hauteur

W Inlandsis Mont Hoessly

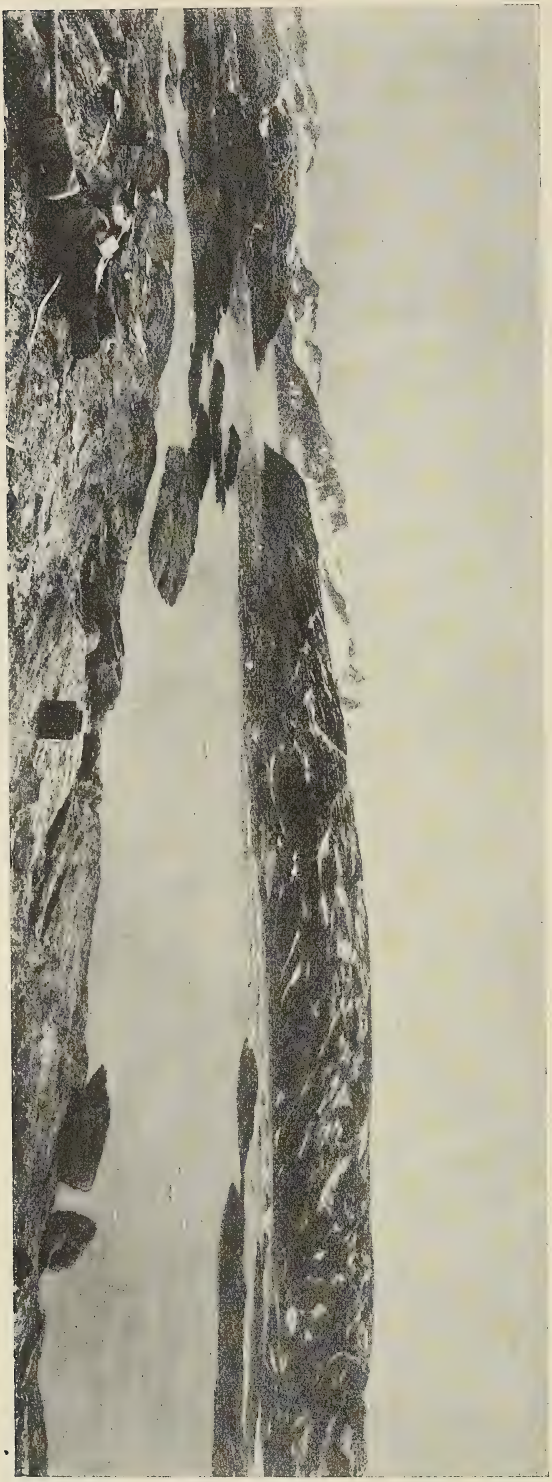
H—  —H

Phot. F. G.

Panorama de la région du dépôt sur le Sermilikfjord; côte E, 245 m d'alt., 3 VIII 1912.

Phot. F. G.

Panorama (partiel), du dépôt au Sermilikfjord; côte E. à 245 m d'altitude. Voir Cartes, planches III et IV.



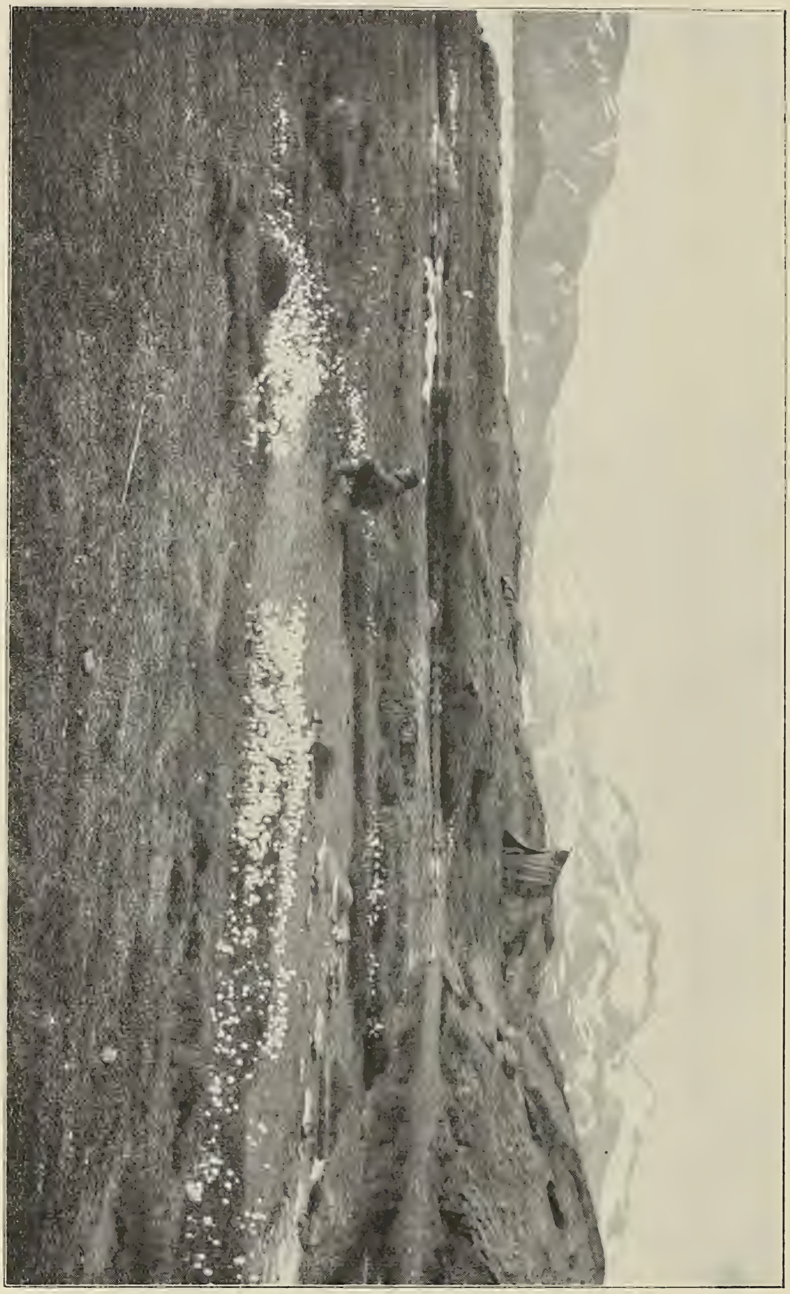
Panorama partiel du dépôt (Suite).

de la montagne terminale arrondie et dont nous venons de parler, est de 850 m.

A droite nous tombons sur le groupe de sommets no. 25. Là aussi la limite de travail glaciaire (Schliffgrenze) se voit admirablement bien, elle se trouve vers 800 m. La plaine de névés énormes monte vers la droite jusqu'au sommet dont l'altitude est 1310 m. Encore plus à droite nous voyons suivre des formes douces derrière lesquelles on voit surgir au loin le groupe 26 formé de sommets arrondis (environ 990 m) qui correspondent probablement déjà à la montagne qui se trouve au NW des colonies d'Angmagsalik, au delà de la grande baie. Le groupe 27 (environ 940 m) doit être situé au NW de la colonie. C'est avec lui que se termine la partie reproduite sur la planche photographique A.

Il reste à parler de la vue offerte par le côté du fjord de Sermilik où nous nous trouvons nous-même. Ici il faut comparer aussi le panorama, reproduit sur la planche A et B, de même notre carte à 1 : 200,000 sur la planche II. La planche A donne les détails de certaine parties, la planche B, la vue générale de tout le panorama. Vers le nord la pente monte derrière nous jusqu'au Hösslyberg (470 m). Autour de notre point de vue s'étend cette surface si caractéristique de rochers de gneis arrondis. Vers l'est, nous distinguons l'île de Umitùjarajùit, qui se projette sur la terre ferme. Vers le sud notre regard rencontre au loin l'océan. Entre le sud et le sud-ouest s'étend le massif haut, étendu de l'île de Kekertarsùatsiak. Entre cette île et notre point de vue s'étend un labyrinthe d'îles petites et plates, dont les parties qui apparaîssent très foncées dans la photographie, (voir planche photographique A en bas à gauche) se composent de roches très rouges. Entre les directions SSW et ESW on voit encore ces montagnes lointaines élevées, qu'on distinguait pour la première fois depuis le camp 28. Le sommet 29 (1060 m) et les points 600 et 1020 du panorama du camp 28 ont été identifiés avec certitude. Du SW ou NW c'est le dos très uniforme, long de 16 km du »Gauleberg« qui forme l'horizon. Derrière ce dos il faut se figurer la Petersenbucht qui s'étend très loin vers le nord. Devant le »Höslyberg«, on voit l'embouchure de ce fjord très étroit d'où nous sommes sortis. L'entrée de ce fjord montre des courants de flux et reflux très intenses, dépassant la vitesse qu'on peut atteindre avec un kajak. Presque exactement de la direction de NW nous pouvons voir la moraine, d'où nous avons fait nos photographies du camp 29. Ici c'est l'inlandsis qui forme l'horizon.

Si nous résumons la morphologie de ce côté du fjord, nous trouvons l'analogue de ce que nous avons constaté pour l'autre bord du grand Sermilik; dans le voisinage du fjord et jusqu'au altitudes de 600 et 800 m, les formes sont absolument arrondies avec orientation NS. Plus loin du fjord, et à un niveau plus élevé, nous rencontrons vers le



Près d'Angmagsalik (Vue prise à 1 km de la colonie, en août 1912). Montagnes de 1000 mètres au fond.

Phot. de Quervain.

SW un groupe plus élevé, dont les formes sont aiguës et qui n'ont pas été en contact avec la glace. Nous soulignons encore un autre fait très caractèristique. C'est la grand rôle que jouent les diaclases qui sont très bien visibles dans leur parallèlisme, et qui aussi bien pour les petites

Vega Fjeld (1100 m) N

NNW

horizon

Vue prise du Sømandsfjeld (594 m sur la baie (Tasiûsak) d'Angmagsalik.

Début de septembre 1912.

formes, que pour les grandes formes de la topographie, ont conduit l'action d'érosion. Nous avons eu l'impression, que même l'orientation du grand fjord du Sermilik en dépendait.

Comparaison de quelques traits morphologiques de la côte est avec ceux de la côte ouest.

a) Les montagnes près de la colonie d'Angmagsalik. (Comparer les photographies prises au haut du sommet du Sömannsfjeld, planche B, pag. 00).

Dans cette région il faut également distinguer une zône d'altitude avec des formes arrondies, jusqu'à 600 m, et des cimes plus élevées, depuis environ 800 m avec des formes alpines. Mais on est frappé quand on compare avec les régions de la côte de l'ouest, combien les formes arrondies ici sont déjà attaquées superficiellement. (Voir les photographies faites sur le haut du Sömannsfjeld qui forme un amas de blocs détachés, ce qui est du reste aussi le cas sur son flanc). La surface arrondie d'un niveau inférieur paraît plus fraîche, bien que là aussi l'effritement du rocher soit bien avancé par place. L'autre différence qui frappe, en comparant avec la côte occidentale, c'est tout ce monde de sommets et d'arêtes, de formes aigues, travaillées par l'érosion. Ce sont des formes qui rappellent celles des Alpes. C'est du reste le caractère que nous avons déjà appris à connaître par le panorama des derniers camps. On gagne l'impression finale que l'inlandsis, par ses grands effluents du Sermilik et du fjord d'Ikerasarsuak a sans doute laissé des traces très énergiques de son activité. Mais il n'a pas pu dominer autant que cela a été le cas sur la côte ouest. Ce caractère change à l'ouest du Grand Sermilik.

Quand à estimer le temps qui s'est écoulé depuis que l'inlandsis a quitté ses passages sur l'île d'Angmagsalik, on trouvera la moyenne en étudiant l'acroissement de quelques deltas, qui sont en train de se former dans plusieurs petits lacs. Nous dirons en terminant que les montagnes qui entourent Angmagsalik ne paraissent plus porter des glaciers locaux. Toute fois, il reste dans certaines niches des flaques de neige qui existaient en tout cas encore en septembre 1912.

b) Production d'isbergs par le Grand Sermilik.

Après avoir vu les effluents les plus productifs la côte ouest (le grand et le petit Karajak, le Sermilik de la même région, le Torsùkatak et le grand glacier de Jakobshavn), j'ai eu l'impression que la quantité d'isbergs, produits par le grand Sermilik de la côte est ne le cède en rien aux concurrents de la côte de l'ouest, que nous venons de citer.

Quant à la formation de la glace sur la mer, nous voyions encore depuis le camp 28 quelque chose comme une barrière, devant l'embouchure du grand Sermilik, mais quand je passais dans cette région le 1 août, dans un oumiak, il n'y avait plus que quelques débris de »Storis« qui nous barraient le chemin. Du reste la glace de l'hiver rompue

se trouvait encore lors de notre descente de l'inlandsis, sur les parties intérieures du Petersenbucht, et le 23 juillet, nous avons encore rencontré dans le »Hundebucht«, les restes de la glace de l'hiver collés au parois. Le 30 juillet il n'en restait plus rien.

c) L'augmentation du niveau des sommets depuis la côte vers l'inlandsis.

M. de Drygalski et O. Nordenskjöld ont attiré l'attention sur le fait, qu'à la côte occidentale le niveau de la »zone côtière« ne monte pas vers le bord de l'inlandsis, mais qu'il s'y abaisse et y forme une sorte d'auge très plate. Nous pouvons constater, qu'au moins dans la partie de la côte est, que nous avons vue, il ne pe ut être question du même phénomène. On peut même constater le contraire. Si nous regardons la carte à 1 : 500,000 qui contient les altitudes mesurées par les Danois et par nous mêmes, nous y trouvons, allant du sud au nord vers l'inlandsis, une augmentation du niveau des sommets montant de 1000 à 2000 m, c'est à dire, d'environ 14 $^0/_0$. Plus au nord du Sermilik, cette augmentation de l'altitude des sommets continue, jusque vers le »Schweizerland« où il faut admettre une altitude des sommets de 2500 à 3000 m.

Cette asymétrie entre la côte occidentale et orientale, est importante à connaître, si on veut tirer certaines conclusions générales sur la nature de l'inlandsis, comme nous allons le faire.

Résultats topographiques de la traversée.

(Comparer les planches I et II.)

Le problème à la résolution duquel notre traversée devait contribuer, avait déjà été posé par des recherches précédentes, surtout par la traversée de Nansen. Il avait trouvé pour son profil à 64° de latitude une couverture complète par un inlandsis qu'on pouvait extrapoler avec la plus grande probabilité pour tout le Grönland du méridional voisin. En présence du fait, que l'inlandsis a été constaté également sur le bord intérieur de toutes les côtes plus septentrionales, on pouvait attendre une situation analogue pour des profils de la partie nord du Grönland. En tout cas l'idée première du baron de Nordenskjöld, que des oasis à l'intérieur de Grönland étaient possibles, semblait déjà presque exclue. Il avait supposé que les montagnes qui se trouvent sur les deux côtes du Grönland, pouvaient suffisamment retenir l'humidité, pour que les vents qui y passeraient, arrivassent à l'intérieur très secs, ayant le caractère d'un föhn et ne fournissant plus assez de précipitations pour former un inlandsis. Il s'imaginait la possibilité d'une flore et d'une faune analogue à celle qui se trouve à l'intérieur des fjords. Des recherches récentes sur l'époque glaciaire de l'Amérique du Nord

nous prouvent, qu'en réalité des ilôts de ce genre, situés au milieu d'un grand inlandsis, ont existé; cela a été le cas pour le Wisconsin. Je touche ici en passant la possibilité théorique d'une limite de neige supérieure, qui se trouverait là où l'évaporation croissant avec l'altitude, dépasserait les précipitations diminuantes. Mais les conditions réelles du Grönland ne correspondent pas à cette supposition, ainsi qu'on le verra dans la partie météorologique.

La traversée de Nansen n'avait pas liquidé une autre question: l'existence de sommets et même de chaînes de montagnes entières, n'était elle pas possible à l'intérieur du Grönland sur d'autres profils?

Aucune raison décisive n'y contredisait. Si des formes montagneuses à parois très inclinées, où la neige ne pouvait tenir, existaient à l'intérieur dans une certaine étendue, leur présence devait se traduire au bord de l'inlandsis par l'apparition de moraines correspondantes. Ces cas ne sont pas connus; cependant la plus grande partie de la zone bordière n'a pas encore été examinée. De l'autre côté, ce matériel morainique pouvait aussi se trouver mêlé à la moraine du fond, dans le cas où ces montagnes inférieures, formeraient en même temps la limite du système d'écoulement glaciaire en question. Ce serait le cas des débris de rochers, qui tombent dans la rimaie, et qui théoriquement ne doivent sortir que sur les bords inférieurs du glacier.

Abstraction faite de ces considérations, on peut se figurer tous les cas intermédiaires, entre une glaciation semblable à celle des Alpes à l'époque glaciaire, et un état encore plus développé, où seul les sommets atteignant 4000 m, auraient dépassé le niveau de la glace. On pouvait parfaitement admettre une situation analogue pour l'intérieur du Grönland.

C'est le résultat géographique le plus important de notre traversée de constater, que dans notre profil du Grönland moyen, ces nounataks centraux n'existaient pas. Au contraire, notre profil ressemble sous ce rapport à celui de Nansen, en posséde la même forme symétrique, d'une régularité presque géométrique, montrant un inlandsis qui domine les formes de sa base et qui monte depuis la côte vers l'intérieur d'abord rapidement et en suite de plus en plus lentement; donc un inlandsis dont la forme de surface réalise sa propre loi, celle d'un liquide presque consistant avec accumulation centrale et ablation sur la périphérie. Depuis que notre profil est venu s'ajouter au seul profil jusque là existant, on peut parler pour la première fois d'un type de profil de l'inlandsis, — type qui depuis a été confirmé.

Immédiatement nous devons faire remarquer que nous aurions trouvé des conditions déjà sensiblement différentes, si notre traversée avait abouti seulement 100 km plus au nord-est. En ce cas, si nous n'avions pas trouvé des »nounataks centraux«, ils auraient pourtant été

rencontrés à 100 km du bord de l'inlandsis est encore tellement plus haut que l'inlandsis à cette endroit, qu'ils n'auraient pas été couverts, même s'ils s'étaient trouvés à l'intérieur: je parle de toute cette région des »montagnes du Schweizerland«. L'inlandsis n'aurait alors pas abouti vers l'est avec une base régulière, mais avec un renflement considérable. La seconde question est celle de la plus grande altitude trouvée par notre profil. Bien que ce profil ait été plus long de 60 % que le profil de Nansen, son altitude a été plus petite que celle trouvée par Nansen, 345 km plus au sud. Ce qui veut dire que même dans des régions de climat très semblable la plus grande altitude du dôme de l'inlandsis n'est nullement proportionnée à son étendue horizontale. Même il n'est pas dit que cette hauteur varie en même sens que l'étendue. Des précipitations plus intenses, combinées avec une ablation plus forte — les conditions du Grönland du Sud — paraissent favoriser un profil plus bombé, avec un écoulement de la glace plus intense; mais la base formée par la terre sousjacente paraît avoir son influence elle aussi.

Profil dans la direction NS. Nansen a trouvé vers le nord, perpendiculairement à son profil, une montée de 3 à 7 ‰; il admettait la continuation plausible de cette montée pendant 150 km et en suite un abaissement lent, correspondant avec la diminution des précipitations vers le nord. Le profil trouvé par nous semble une confirmation de cette hypothèse, très plausible en elle-même. Mais déjà les voyages de Peary en 1892 et 1895 avaient trouvé non loin du bord septentrional de l'inlandsis des altitudes atteignant 2400 m, et les voyages nombreux, entrepris depuis lors par Knud Rasmussen, le confirment. Et les mesures faites par nous-même n'indiquent nullement un abaissement vers le nord; bien au contraire, elles indiquent une montée générale vers le nord-est, ceci non seulement au point culminant de notre traversée, mais pour toute la partie centrale de la traversée.

C'est ici que se confirme la valeur d'une mesure régulière des inclinaisons de la surface, au lieu d'une simple mesure du profil luimême.

Position de la hauteur maxima de l'inlandsis. Si nous comparons notre profil avec celui de Nansen, nous trouvons dans les deux cas la hauteur maxima déplacée du milieu vers l'est; et plus au nord de notre profil cette tendance paraît s'accentuer encore plus. Cependant pour les profils situés encore bien plus au nord, cela ne doit plus être le cas, ainsi que nous le savons par la traversée de Koch en 1913. Notre traversée a donné ce résultat reconnu et exprimé par nous dans le commencement, que la couverture de glace du Grönland est en quelque sorte segmentée dans la direction nord sud, en ce sens, qu'en tout cas il existe 2 centres de glaciation: l'un entre le profil de Nansen et le profil suisse à environ 65° de latitude et 44° de longitude, et un second

centre au nord-est de notre traversée. L'abaissement entre ces 2 centres rappelle le souvenir du fameux »Frobisherkanal« et donne une petite satisfaction au vieux cartographe du Grönland. Notre constatation de deux centres au lieu d'un centre unique, qu'on admettait jusqu'ici, paraît intéressant non seulement au point de vue topographique local, mais aussi au point de vue morphologique général. La traversée danoise nous semble faire soupçonner même un troisième centre, au nord de cet itinéraire; mais les données exactes manquent jusqu'à ce jour.

Toutefois il nous a paru permis et même désirable de tenter un premier essai d'esquisser la topographie de tout l'inlandsis, basé sur tout le matériel que nous était accessible en 1914. Une pareille esquisse, représentée par des isohypses, aussi approchées qu'elles soient, sera sans doute utile pour la topographie terrestre générale. (Voir planche II). Ces isohypses ont pu être dressées avec un peu plus de certitude sur la carte de traversée proprement dite à 1 : 4000000 (voir planche II_2).

Revenons aux constatations topographiques de notre traversée. Pour ce qui concerne l'orientation des inclinaisons dans leurs grands traits, nous remarquons que de 50 à 250 km, la montée la plus forte est dirigée vers le NW et WNW; l'orientation des isohypses correspond en ceci avec la montée bien forte trouvée dans le profil de Peary. A partir de 250 km, jusqu'à l'altitude maxima (410 km), la montée maxima est dirigée vers l'est. Au delà de l'altitude maxima jusqu'à peu près 550 km, on trouve immédiatement une inclinaison vers le SE et le SSE, qui tourne vers l'est, trahissant ici l'influence du Sermilikfjord, qui se fait sentir vers l'intérieur jusqu'à 60 ou 70 km.

Pour un observateur qui se trouve à la plus grande hauteur de l'inlandsis, les surfaces s'abaissent dans les 150 km voisins des deux côtés environ dans la direction de la plus petite distance au bord de l'inlandsis. L'orientation approchée de cette »arête« maxima est d'environ N 30°E. La direction moyenne de notre traversée coupe cette direction dans un angle qui n'est pas tout à fait droit, mais de 80°. La coupure aurait été perpendiculaire pour une traversée qui aurait le même but, mais aurait commencé à 68°30′. Ce profil aurait été plus court de 8 $^0/_0$ et la hauteur maxima aurait été plus petite d'environ 50 m. Cette dernière direction aurait été en même temps perpendiculaire à l'axe général de tout le continent pour cette latitude. En d'autres termes, l'axe du continent est identique à l'axe de la glaciation. On peut donc dire que la forme de la surface de l'inlandsis prise dans son entier, dépend des grands contours du pays le long du bord de l'inlandsis et non des détails locaux.

Pourtant il ne faut pas perdre de vue plusieurs faits qui semblent infirmer cette idée générale.

Position de la hauteur maxima et rôle des deux côtes.

Il faut revenir au fait que la hauteur maxima n'a été rencontrée qu'après les $^2/_3$ du chemin. Avec Nansen et E. de Drygalski nous admettons une formation correspondante du fond. Les haut sommet du Schweizerland qui s'avancent vers l'inlandsis et l'augmentation des hauteurs des sommets, depuis le côté est vers l'intérieur (voir planche III, figure 4) confirme ces idées, surtout celles de Drygalski. Certainement les côtes E et W, dans la latitude où nous avons fait la traversée, n'ont pas les même relations avec l'inlandsis. Les montagnes plus élevées de la côte E, dans ces latitudes, forment en quelque sorte la colonne vertébrale de l'inlandsis, elles dépassent la limite du névé et là, où elles sont en contact avec l'inlandsis, elles contribuent à le nourrir. En même temps elles empêchent la glace de l'inlandsis de s'écouler vers l'est et l'obligent de s'écouler vers l'ouest, où elle est retenue pour y fondre, dans une sorte d'auge qui se trouve le long du bord intérieur de la côte. Nous nous rattachons ici aux vues exposées par M. de Nordenskjöld.

La plus grande altitude de l'inlandsis est située sans doute à l'ouest des montagnes visibles de la côte orientale; il n'est pas nécessaire d'en conclure que le terrain rocheux est encore plus élevé dans cette partie, sous la glace. Nous savons que la glaciation de la Fennoscandinavie, le centre de la glaciation du maximum ne se trouvait pas coincider avec la plus grande altitude des montagnes scandinaves, mais se trouvait à l'est au delà de la région du Golfe de Bottnie. Par analogie on peut se figurer que la glaciation grönlandaise a pris naissance dans les montagnes de la côte est et a fini par s'élever plus haut que ces montagnes sans qu'on ait une raison de chercher sous la plus grande altitude de la glace, la plus grande altitude de la profil rocheux. Du moment où la glace montée au-dessus du niveau du névé est entrée avec de vastes surfaces dans la limite de l'accumulation, rien ne s'oppose à ce quelle devienne plus élevée que les montagnes. Il fallait pour ça seulement un écoulement suffisamment lent, et une zone d'ablation suffisamment éloignée.

Dans ce qui suit nous allons parler de quelques détails de la topographie de l'inlandsis, qui prouveront qu'on irait trop loin on admettant une indépendance plus ou moins absolue de la conformation du fond.

Caractère à gradins. Des deux côtés de l'altitude maxima on trouve des parties de profil avec pentes plus fortes, alternant avec des parties moins inclinées; il faut distinguer de ce phénomène les parties plus réduites qu'on peut expliquer d'après l'analogie des dunes. Dans les cas dont nous parlons et où il s'agit de bien des km. nous sommes obligés de penser à des irrégularités du fond, qui se font sentir à travers la couverture de glace. Sur le versant ouest, à partir du bord de l'inlandsis, jusqu'à 1800 m de hauteur (distance 150 km) en comptait 10 de ces gradins. Ils sont suivis, de 1830 à 1930 m d'une »plaine« parti-

culièrement marquée et qu'il faut mentionner déjà parce que 20 à 30 km au sud se serait trouvé le commencement de cette fameuse plaine des Lapons. Leur indication est donc vérifiée au point de vue qualitatif mais avec cette restriction qu'ils avaient énormément exagéré l'étendue vers l'est.

Plus loin, vers la hauteur maxima, on trouve encore 4 de ces gradins jusqu'à la hauteur de 2200 m. La partie horizontale du gradin est par places un peu rétrograde, même dans ce dernier cas.

Ce n'est qu'à partir de 2200 m qu'on trouve une montée uniforme jusqu'à la hauteur maxima. La situation de cette hauteur est relativement bien marquée et on ne trouve rien d'une plaine très étendue avec pente tout à fait indécise. Sur le versant est, nous trouvons de nouveau à 50 km de l'altitude maxima, une plaine bien marquée, de 12 km de large vers 2300 m et des vagues plus marquées, moins longues, à 1900 m, de même vers 1650 m. On était de nouveau frappé par une descente très faible jusque vers 1300 m d'où la descente devenait très rapide.

Quand à l'ordre de grandeur de ces gradins, leur largeur était d'abord 7 à 8 km, plus loin 12 à 15 km, comptée du commencement d'un gradin à l'autre. La plaine des Lapons était plus étendue en elle-même, elle mesurait 20 km et le gradin entier 60 à 70 km.

A ces irrégularités systématiques de la surface se joignent d'autres manifestations du fond; des crevasses encore très loin à l'intérieur de l'inlandsis, (qu'on compare le ruban des isohypses à la planche I, où les crevasses sont marquées). On y trouve les crevasses les plus importantes à 125 km du bord et il y en a encore à 145 km. Les premières correspondent absolument au canaux de glace trouvés par E. de Nordenskjöld sur l'inlandsis du »Spitzberg« et qui ont été rencontrés par B. Bäbler et par moi-même, en 1909, environ à 100 km du bord de l'inlandsis, dans la région du grand Karajak. Il est très remarquable que les grandes crevasses rencontrées en 1912 se trouvaient exactement en arrière du grand effluent du Jakobshavn, à une distance de 125 km de son embouchure. Dans la traversée de Nansen, qui ne se faisait pas près d'un grand effluent, les crevasses ne se trouvent que jusqu'à 40 km du bord. Nous pouvons donc considérer comme un fait, que les grands fjords productifs de la côte, se font encore sentir à l'intérieur de l'inlandsis à plus de 100 km du bord au moins par la formation de ces grands systèmes de crevasses.

Cette conclusion semble aller un peu plus loin que la conception de E. de Drygalski, qui voyait dans ces effluents producteurs d'isbergs seulement les débouchés de cette grande auge d'ablation qui s'étend du nord au sud, le long de la côte ouest. Nous avons vu nous-même dans la région du Torsùkatak, descendre l'inlandsis, dans un énorme

cirque, dont le Torsùkatak paraîsait former l'écoulement. Les deux constatations ne me paraîsent pas être en contradiction absolue.

Le problème de l'épaisseur de l'inlandsis. Cette question très importante reste ouverte. Déjà en faisant le programme je m'étais rendu compte, que la méthode de la mesure de la pesanteur à l'aide d'un pendule, proposée par d'autres, ne pourrait guère donner des résultats. Elle a aussi été abandonnée par ses promoteurs. Par contre l'application de la réflexion des ondes électriques au fond de l'inlandsis, proposée par moi en 1914 aurait certaines chances d'être appliquable à ce problème. De même on pourrait songer à l'application de la réflexion d'ondes sonores, tenté depuis lors sur des glaciers suisses, par mon collègue Mr. Mercanton, il est vrai sans succès jusqu'ici. Une méthode très rapprochée de la dernière est celle élaborée et appliquée par Mintrop, qui enrégistre optiquement les phases d'une petite tremblement artificiel, produite par une petite explosion et qui conclut à la profondeur d'une discontinuité éventuelle, en mesurant rioureusement les intervalles de temps. Enfin il y aurait la méthode de Langevin, qui emploie des ultrasons, qui a eu des résultats si merveilleux pour mesurer la profondeur de la mer, et dont l'application aux profondeurs de la glace va être tentée en Suisse sur l'initiative de M. Mercanton. En cas de réussite il se propose de faire la même tentative sur l'inlandsis.

Quant à l'ordre de grandeur de cette profondeur, nous pensons qu'elle ne dépasse pas quelques 100 m aux endroits où se trouvent les irrégularités de profondeur. On peut se demander s'il s'agit d'obstacles plus ou moins isolés, où de collines plus ou moins longues. Dans le premier cas, il faudrait trouver les traces de moraines intérieures, dans la région de l'ablation. La moraine qui a été étudiée par Mr. Mercanton a été, d'après mon idée, une de ces moraines intérieures.

Etat stationnaire de l'inlandsis? L'inlandsis pris comme glacier, se trouve-t-il actuellement dans un état stationnaire, ou bien est il une relique qui ne correspond plus aux conditions actuelles, ou bien encore, se formerait-il de nouveau dans les conditions actuelles, si on le supprimait ? A la première question, il a été donné une réponse affirmative par nos mesures et conclusions météorologiques qu'on trouvera plus loin. En ce sens, l'inlandsis est vraiment un glacier stationnaire, c'est à dire, son accumulation et son ablation sont en équilibre. Quand à la seconde question, il faudrait admettre une épaisseur de glace de plus de 1000 m, pour que dans les conditions climatologiques actuelles, il ne se forme plus de glaciation générale. Enfin si la hauteur de la surface actuelle était diminuée de 1000 m, la partie qui atteindrait le niveau du névé ne serait plus suffisante. Si en même temps la répartition des altitudes était assez uniforme, changeant avec des parties moins élevées, il faudrait tenir compte de la tendance à une augmentation

de la limite du névé vers l'intérieur (voir notre conclusion dans la partie météorologique). Celà pourrait avoir comme suite un commencement de glaciation partant non pas du milieu mais des bords. En réalité, la glaciation est probablement partie de la côte orientale.

Il ne faut pas perdre de vue, qu'on ne pourrait éloigner l'inlandsis actuellement sans que cela change les conditions climatologiques. D'un côté, ces conditions déterminent l'état de l'inlandsis actuel, mais d'un autre côté, l'état de l'inlandsis actuel détermine aussi ces facteurs. Déjà nos recherches sur la circulation d'air du Grönland faites en 1909, démontrent le rôle important de ce haut-plateau dans la circulation polaire. Dans la même mesure où disparaîtrait ce haut plateau, la séparation de la circulation en une partie de l'est et une partie de l'ouest disparaîtrait; les dépressions qui apportent les précipitations circuleraient plus fréquemment sur le Grönland. Sans doute la température monterait en même temps, mais sans que les conditions de la Norvège soient atteintes, même de loin. Il me semble, que l'influence de l'augmentation des précipitations prévaudrait. Ces réflexions (qui ne sauront jamais être absolues) peuvent s'exprimer et se résumer aussi de la façon suivante: Si, comme on sait, les arbres ne peuvent pas croître jusqu'au ciel, c'est aussi le cas pour l'inlandsis; car en augmentant de plus en plus, l'inlandsis se crée une circulation de plus en plus anticyclonale, c'est à dire, une situation qui lui coupe de plus en plus sa nourriture.

Troisième section.

Les Observations et Résultats météorologiques de la Traversée.

Remarques liminaire.

Nos observations météorologiques de la traversée soivent être appréciées comme étant les premières données systématiques sur la partie centrale de l'inlandsis du Groenland pour la saison d'été proprement dite. En ceci, elles sont jusque là restées les mesures uniques, et complètent d'une façon heureuse d'un côté les observations d'été, faites dans la zone bordière, exécutées en 1883 par le baron E. Nordenskjöld, en 1886 par R. E. Peary, en 1893 par Moltke et Garde, et en 1909 par Stolberg, Bäbler et moi-même. D'un autre côté, elles s'interposent tant au point de vue de l'espace que de la saison entre les observations de la traversée de Nansen, faite en automne, et de la traversée de Koch au Nord, faite au printemps.

Nous avons espéré pouvoir nous rapporter à l'occasion de cette publication-ci aux observations cette dernière traversée, ce qui aurait été très heureux au point de vue de la généralisation. Malheureusement nous n'avons pas pu attendre, en fin de compte, cette autre publication.

A. Les Instruments.

Il a déjà été question de la mesure des pressions. Les températures ont été lues presque exclusivement à un psychromètre à aspiration d'Assmann (petit modèle). On a tenu compte de la petite correction de — 0,1° du thermomètre sec. Par exception, on s'est servi d'un thermomètre-fronde de Fuess; de même on a employé des thermomètres à maxima et à minima de la même maison. Les corrections exactes de ces derniers instruments, faites au Groenland, se sont perdues et les instruments eux-mêmes m'ont été volés (bien entendu en Europe!) avant que je me sois aperçu de la perte de ces corrections. Nous avons, du reste, pu constater que ces dernières ne pouvaient pas dépasser

quelques dixièmes de degré. L'humidité a été déterminée d'abord avec le psychromètre à aspiration et ensuite (au dessous de zéro), avec un hygromètre à cheveux vérifié. La vitesse du vent a été mesurée presque exclusivement avec un petit anémomètre à main. Pour réduire les données, nous avions à notre disposition les corrections fournies par le fabricant, de même une vérification absolue que nous avions faite nous-mêmes. Les coefficients variaient de 1,03 à 0,98 (11 mètres). Pour 20 m on nous a indiqué le coefficient 0,95. Vu la petitesse de ces corrections, nous les avons négligées. La direction du vent a été constatée par l'orientation d'un fanion en soie. La nébulosité a été estimée en dixièmes, la forme des nuages indiquée d'après la classification internationale. On a fait un certain nombre de mesures avec un actinomètre de Steenstrup (constante 0,126), en tenant compte des recommandations de Mr. Steenstrup. Malheureusement la comparaison avec les mesures analogues faites à Godhavn, ne pouvait se faire, parce que cette dernière station a, par hasard, omis ces mesures pendant l'époque de notre traversée. Nous avons aussi exécuté quelques mesures sur l'électricité de l'air.

Les heures des observations et leur exécution.

On a tâché, dans l'intérêt des comparaisons possibles, de maintenir les heures utilisées aux stations de la côte, c. a. d. 8^h du matin, 2^h de l'après-midi, 9^h du soir (heure locale). Quiconque connaît les conditions d'un voyage pareil, ne s'étonnera pas, si ça ou là une heure-terme a dû être plus ou moins différée. Nos heures de voyage aussi bien que nos heures de sommeil dépendaient absolument de l'état de la surface et devaient se faire tantôt dans la nuit, tantôt de jour.

Voici encore quelques remarques qui se rapportent aux tableaux qui vont suivre. Il nous semblait aller de soi, que les observations devaient être données in extenso. Les heures se rapportent à l'heure locale du méridien d'observation. L'indication de la position est faite par le numéro du camp et la distance en kilomètres mesurée sur l'itinéraire depuis le point de départ au bord de l'inlandsis de la côte ouest. Quand il s'agit de positions qui se trouvent entre deux camps, on a indiqué la distance depuis le dernier camp. La traversée s'étant effectuée à peu près en ligne droite, cette indication a paru préférable. Les positions géographiques en longitude et latitude se trouvent déjà dans un tableau précédent, ou bien on peut les puiser dans la carte de la traversée, planche II. Les altitudes entre les camps sont interpolées avec toutes les précautions. Les pressions sont toutes réduites aux mesures absolues, faites avec l'hypsomètre.

En réduisant les indications d'humidité tirées du thermomètre à aspiration, on a admis la présence de la vapeur de glace, quand la température du thermomètre sec était aussi au-dessous de zéro. Pour

la vitesse du vent, on trouve deux colonnes, la première contient la vitesse momentanée, c. a. d. mesurée sur un chemin de 200 m du vent, la seconde colonne contient la moyenne depuis la dernière lecture. Ces dernières données ont été prises seulement au camp. L'anémomètre se trouve pour toutes les mesures à une hauteur de 1,50 m. Les risques provenant des chiens ont empêché ces mesures aux premiers camps, aussi bien que l'exposition des thermomètres à extrêmes. Le thermomètre à minima pour l'air était fixé à 1,40 m de hauteur à l'ombre de la tente. Il s'est trouvé dans un abri métallique mince, à demi ouvert. le minimum de la surface de la neige a été déterminé en entourant la boule thermomètrique avec de la neige, de façon à la laisser à moitié libre. Nous mentionnons encore que pour la carte de l'itinéraire jusqu'au camp 2, nous avons pu utiliser à côté de nos propres mesures, celles qui ont été faites par le Prof. Mercanton et ses collaborateurs, le Dr. Jost et le Dr. Stolberg. Ces trois participants de la traversée restèrent à la côte occidentale, conformément à notre programme, et travaillèrent dans notre région de départ jusqu'au 19 août.

B. Journal météorologique et topographique de la traversée.

Le texte qui se trouve à droite de la table se rapporte le mieux possible aux mêmes jours que les chiffres. Il réunit le texte du journal météorologique avec les notes sur la situation météorologique et topographique. Il nous a paru le plus utile de réunir ces indications topographiques avec les données météorologiques parce que il y a une connexion intime entre elles. Il faut comparer avec ces indications topographiques notre carte du ruban de la traversée, planche I, de même le texte de la partie topographique.

20 Juin. Indications météorologiques. 0^h50 a. Comparaison de tous les baromètres. La montée continue de la pression nous engage à partir. Départ 11^h50 dans le brouillard. Rarement le soleil perce un peu. 9^h p le temps s'éclaircit. Cu Str-Cu au-dessus de Nugsuak.

Itinéraire jusqu'au camp 1. De 10^h50 a jusqu'à 5^h15 p. Nous allons vers l'est jusqu'à l'interruption de la grande moraine à 300 m; neige jusqu'à ce point. Plus loin surface dégagée de neige avec pierres morainiques, pente de la glace en arrière 7°; au km 0,66 la pente atteint jusqu'à 10°. Vers 2^h milieu de la première plaine. Les crevasses nous obligent à dévier un peu vers la gauche. Vers 3^h commencement d'une nouvelle montée, inclinaison environ 2,5°. Vers 4^h35 nous nous trouvons depuis 20 minutes sur un second et vaste plateau (s'abaissant un peu dans la direction de notre chemin), sur lequel nous avançons à 6 km à l'heure. Au bout du plateau le camp 1. Sur notre chemin, la glace était à nu, les courants d'eau étaient creusés de 20—50 cm. Partout

Observations du journal météorologique et topographique de la traversée.

Date	Heure	Camp	Distance au bord de l'inlandsis et au dernier camp	Hauteur au-dessus de la mer	Pression mm	Température de l'air	Humidité relative	Tension de la vapeur	Direction du vent	Vitesse du vent, mètres par sec.	Vitesse du vent, Mesure intermédiaire	Nébulosité 1-10	Forme des nuages	Direction des nuages	Extrêmes de température et aspect du ciel. Précipitation.
20.	0.50 a	bord	—	556	707,6	—	—	—	—	—	—	—	—	—	—
Juin	5.25	»	—	556	708,7	0,2	—	—	—	—	—	—	—	—	—
1912	11.00	»	—	556	709,5	—	—	—	S	1,0	—	—	—	—	—
	11.50	»	**0**	556	—	1,0	—	—	—	—	—	10	Str ≡	—	—
	12.05 p	—	0,3	600	705,2	—	—	—	—	—	—	—	—	—	—
	12.22	—	0,7	643	701,4	—	—	—	—	—	—	—	—	—	—
	2.00	—	1,5	656	699,4	—	—	—	—	—	—	—	—	—	—
	3.00	—	3,3	707	694,7	—	—	—	—	—	—	—	—	—	—
	3.06	—	3,8	710	694,4	—	—	—	—	—	—	—	—	—	—
	3.30	—	4,9	733	692,4	0,1	93	4,3	SE	2—3	—	9	Ni	—	*° ⊙ vis.
	4.35	—	7,5	790	687,2	—	—	—	—	—	—	—	Ni	—	
	5.15	1	9,5	789	686,9	—	—	—	—	—	—	—	—	—	—
	9.00	1	**9,5**	789	688,6	—1,1	80	3,4	SSE	4,5	—	9	Ci-Str S-Cu	—	Pôle des Ci-Str au N
	11.00	1	—	789	688,2	—	—	—	—	—	—	—	—	—	—
21.	8.15 a	1	—	789	689,1	2,4	73	4,0	SSE	6,3	—	5	A-Cu Ni Cuf	SSE	Ni cuf à NW
Juin	1.00 p	1	0	789	688,6	2,8	—	—	—	—	—	—	—	—	Extremes {air -3,8 neige -3,8
	1.50	—	2,5	813	686,6	—	—	—	—	—	—	—	—	—	—
	2.00	—	2,9	843	684,1	3,7	76	4,5	SE	8,2	—	—	—	—	—
	4.00	—	6,0	907	678,8	—	—	—	—	—	—	—	—	—	—
	5.45	—	8,5	—	—	1,7	—	—	SE	4—5	—	—	—	—	—
	9.15	2	10,0*	979	672,8	—	83	3,9	SE	7,7	—	3	Ci-Str A-Cu	—	nuages au NW

trous cryoconitiques. Plus loin rarement petites places avec neige granuleuse. — Au camp 1, à 300 m vers le SE il y avait autrefois un lac; un trou vertical a dû être rempli par la cryoconite. Cette cryoconite forme maintenant un monticule de environ 1,50 m de hauteur; cela pue. Nous prenons des échantillons. (Voir partie 3).

21 Juin. Remarques météorologiques. $8^{h}15$ a. A-Cu frixus. Vers NW au-dessus de la »terre«, il y a Nimbus cumuliformis. Le ciel n'est pas tout à fait bleu; il a l'aspect de Cirronebula, mais sans halo. — Le vent avait été plus fort pendant la nuit; il augmente aussi vers midi.

Date	Heure	Camp	Distance du bord de l'in-landsis et du dernier camp	Hautenr au-dessus de la mer	Pression mm	Température de l'air	Humidité rélative	Tension de la vapeur	Direction du vent	Vitesse du vent, mètre par sec.	Vitesse du vent, mesure intermédiaire	Nébulosité 1-10	Forme des nuages	Direction des nuages	Extrêmes de température et aspect du ciel Précipi-tation
22.	8.15 a	2	**19,5**	979	672,5	0,2	74	3,4	SE	10,2	—	—	—	—	Extremes{air -2,5 neige -3,0
Juin	10.40	2	—	979	672,5	—	—	—	—	—	—	—	—	—	—
	2.00 p	2	—	979	671,9	2,2	75	4,0	SE	8,3	—	0	—	—	ciel laiteux
	3.23	2	0	979	672,2	—	—	—	—	—	—	—	—	—	—
	4.10	2	3,3	1031	668,0	—	—	—	—	—	—	—	—	—	—
	4.50	2	4,0	1051	666,3	—	—	—	—	—	—	—	—	—	—
	5.50	2	7,8	1076	664,4	—	—	—	—	—	—	—	—	—	—
	9.00	3	10,0	1120	661,8	—1,3	84	3,5	SE	6,6	—	1	A-Cu	—	nuages à l'hor. SW-N
	9.17	3	**29,5**	×	—	—	—	—	—	—	an	—	—	—	—
	11.44	3	—	—	—	—	—	—	—	—	6,0	—	—	—	—
23.	8.51 a	3	—	1120	663,7	—0,9	79	3,4	SE	8,3	—	2	A-Cu A-Str	NNW	A-Cu, vitesse modérée
Juin	11.22	3	—	1120	—	—	—	—	—	—	7,0	—	—	—	Extremes{air -3,5? neige-4,2
	1.55 p	3	—	1120	662,1	0,8	70	—	—	4,4	5,9	—	—	—	clair
	9.00	3	—	1120	—	—2,0	—	—	—	—	—	—	—	—	clair
24.	1.30 a	3	0	1120	660,8	—4,4	—	—	—	—	—	—	—	—	Extreme: air -5,0
Juin	3.00	—	4,0	1181	655,8	—5,0	—	—	—	—	—	—	—	—	—
	4.15	4	10,0	1172	656,7	—	—	—	—	—	—	—	—	—	—
	9.00	4	**39,5**	1172	656,6	0,0	84	3,9	SSE	7,7	—	0	—	—	brumeux
	12.50 p	4	—	1172	657,1	1,2	78	3,9	SE	6,4	an	1	Ci-Str	—	Ci-Str à S
	2.20	4	—	1172	657,4	1,5	77	3,9	—	—	3,3	—	—	—	—
	2.45	4	—	1172	—	0,9	85	4,2	—	—	4,5	5	Ci-Str	—	lent
	7.20	4	—	1172	—	—	—	—	—	—	1,9	—	—	E	—
	9.00	4	—	1172	657,2	—2,2	85	3,4	E	1,0	—	7	A-Str A-Cu	—	au NW

Itinéraire du camp 1 au camp 2. De 1^h p jusqu'à 9^h15 p. Nous commençons à tourner vers le sud pendant 300 m un cours d'eau qui se termine dans un gouffre. Vers 1^h50 p nous montons une pente de 2,5 $^0/_0$; au pied vers le SW, environ 10 ou 20 m plus bas, nous voyons un lac, long 0,5 km, encore gelé dans le milieu. 2^h. Nous allons arriver au haut de la pente. Là, il y a des crevasses. Plus loin une grande plaine (qui s'abaisse dans la direction de notre chemin), large de 3 km environ, limitée par un cours d'eau qui est large d'environ 8 m, profondeur 50 cm; courant très rapide vers le nord. Vient d'un lac, situé à $1^1/_2$ km

plus au sud, long de $^1/_2$—1 km. Ce lac possède, d'après examen par Q., un affluent venant de SE, d'un lac qui se trouve sur un plateau plus élevé avec d'autres lacs. Il faut tourner le lac inférieur; son affluent peut être traversé sur une pente qui descend du plateau du lac supérieur et qui vers l'est et le sud-est monte encore plus haut que le lac supérieur; des raies parallèles et sales descendent vers ces lacs; la pente est assez forte pour qu'on doive aider aux chiens à pousser les traineaux de

Lac dégelé à moitrié sur l'inlandsis, versant W entre les camps 1 et 2; 21 VI 1912. Phot. Gaule.

toutes nos forces. — Entourage du camp 2. Ici l'horizon de cryoconite paraît se trouver en général à la surface; pourtant on voit encore des trous de cryoconite de 15—20 cm de profondeur, presque remplis d'eau.

22 Juin. Remarques météorologiques. Vers 2^h p ciel tout à fait laiteux, mais pas de halo.

Itinéraire du camp 2 au camp 3. De 3^h23 p jusqu'à 8^h p. — La plaine sur laquelle se trouvait le camp 2 continue encore pendant environ 2 km, ensuite première pente. Elle est passée à 8^h10. Dans les dernières 5 minutes, neige par places. Ceci est important à cause des chiens dont les pattes saignaient à cause de la surface de neige dure et pointue. Ici suit une plaine large de environ 1 km. Vers 4^h50, nous sommes presque en haut de la seconde pente. Ici neige continue, épaisse de 10—40 cm. Vers 5^h dans la direction W 20°S jusqu'à W 5°S, région de Pakitsok (point de départ de Peary) visible. Nous arrivons sur une grande plaine, large d'environ 4 km. Au fond, à gauche de notre direction, au pied de la pente suivante, on voit un lac bleu-noir, rond, diamètre estimé 2 km. Sous la neige, il y a 10—20 cm d'eau, par places

plus profonde; porte à peine. Neige à la surface durcie en forme de glace épaisse de 2—3 cm. Quinze jours plus tard, on n'aurait probablement plus pu passer. Ça correspond au marais de névé de Nordenskjöld! A 5^h50 nous passons l'affluent du lac, qui est gelé et qui vient des marais qui se trouvent au sud à 500 m. Après le lac encore une pente de 2 $^0/_0$. Hoessly préfère mettre des skis. Au haut de la pente assez plat pour que Fick et Gaule montent un peu sur le traineau. Peu avant le camp courant d'eau desséché, allant de N à SW. — Au camp 3 neige ancienne, environ 35 cm, gelée à la surface. Porte à peine. Au fond, il y a de l'eau. A 9^h du soir, la neige porte. Depuis le camp en avant suffisamment de montée pour que, au retour d'une reconnaissance le vent nous pousse sur les skis.

23 Juin. Remarques météorologiques. 8^h51 a. Nuages vers l'ouest et le nord-ouest; à l'horizon ils sont sombres et menaçants. Dans la nuit du 23 au 24, sorte de cirrostratus, surtout denses vers le nord, convergeant dans cette direction; le soleil y est caché pendant 2 heures.

Itinéraire. Départ essayé à 6^h p; la neige ne porte pas encore. Le départ est remis à 1^h30 a du 24 juin.

24 Juin. Remarques météorologiques. Camp 4. Dans le vent vif, les habits de ceux qui sont tombés dans le lac se gèlent après leur sortie immédiatement en une cuirasse solide. — L'après-midi, le vent est remarquablement faible; température dans la tente à 3^h15 p 22°, l'humidité relative 40 $^0/_0$. Cette température de la tente reste jusqu'au soir.

Itinéraire du camp 3 au camp 4. Départ 1^h30 a jusqu'à 4^h15 a. Après le départ montée légère. Une demi-heure plus tard à droite lac bleu à 0,5 km de distance. Ensuite nous passons un marais gelé; surface inégale. Un traîneau tombe. A 3 heures, nous sommes sur un haut plateau; avance rapide. Devant nous légère déscente. Dans la partie la plus basse, il y a un lac gelé qui a des parties dégelées. Les chiens du premier traîneau, conduit par Hoessly, y courent, les autres suivent dans une course folle. La glace se rompt sous les traineaux et leur conducteurs. On s'enfonce absolument. Profondeur de l'eau 3 m. — Camp 4: sur ancienne glace, au milieu du lac, oû nous sommes sauvés. Neige dans les environs 40 cm. Vers NW, au bord du lac, on voit des signes de courant d'eau, allant vers le lac.

25 Juin. Remarques météorologiques. 3^h a. Au départ surface de la neige à 4°5. Le soleil réapparaît. En route, surtout après 8^h a, le temps s'éclaircit presque entièrement; restent encore Str-Cu 1—2 et têtes de Cumulus, émergeant au-dessus de l'horizon sudouest et ouest. Ce phénomène nous frappe; de même, les ombres des nuages sur l'inlandsis pendant la matinée nous trompent sur le vrai relief, faisant croire à des bas-fonds.

Date	Heure	Camp	Distance du bord de l'inlandsis et du dernier camp	Hauteur au-dessus de la mer	Pression, mm	Température de l'air	Humidité relative	Tension de la vapeur d'ean	Direction du vent	Vitesse du vent, mètre par sec.	Vitesse du vent, mesure intermédiaire	Nébulosité 1-10	Forme des nuages	Direction des nuages	Extrêmes de température et aspect du ciel Précipitation
25 Juin	1.30 a	4	—	1172	657,6	—	—	—	—	—	—	—	—	—	—
	3.10	4	0	1172	—	—2,5	—	—	—	—	—	7	A-Cu A-Str	—	⊙ disparaît
	5.40	—	6,1	1279	649,8	—2,0	—	—	—	—	—	—	—	—	Extreme: neige -4,5
	8.00	—	11,5	1290	649,6	—2,0	79	3,3	E 33°S	6,9	—	9	A-Cu A-Str	SSW	clair vers E
	10.00	5	17,0	1275	651,3	—	—	—	—	—	—	—	—	—	—
	2.00p	5	**56,5**	1275	650,4	0,5	73	3,5	ESE	4,2	an	0	Cu Ci 0	—	—
	5.00	5	—	1275	650,3	—	—	—	—	—	—	—	—	—	—
	6.10	5	—	—	—	—	—	—	—	2,2	3,7	—	—	—	—
	6.30	5	—	—	—	—1,1	81	3,5	—	—	—	—	—	—	neige —1,9
	9.00	5	—	1275	649,8	—2,9	—	—	SE	4,1	—	1	Ci-Str	—	au NW
	9.10	5	—	1275	—	—	—	—	—	—	2,9	—	—	—	neige —4,5
26 Juin	4.00 a	5	—	1275	648,5	—5,0	—	—	—	—	—	—	—	—	
	5.10	5	0	1275	—	—	—	—	E-ENE	—	2,8	—	—	—	neige —6,5
	8.00	—	7,0	1301	646,0	—2,1	78	3,1	E!	8,0	—	1	Ci-Str	—	—
	9.00	—	—	—	—	—1,0	—	—	—	—	—	—	—	—	—
	10.45	6	14,0	1344	642,2	—	—	—	—	—	—	—	—	—	—
	12.00	6	**70,5**	1344	641,4	—	—	—	ESEzS	—	—	—	—	—	—
	2.00p	6	—	1344	640,8	0,7	81	3,9	SE!	2,3	an	3	Ci-Str	E	Max.: 1,5
	4.14	6	—	1344	—	0,9	85	4,2	—	5,0	2,5	5	Ci-Str	NE	—
	6.07	6	—	1344	—	0,5	86	4,1	—	3,4	2,7	—	—	—	—
	8.53	6	—	1344	642,0	—1,1	83	3,6	ESE	4,5	3,5	9	Ci-Str A-Str	—	nuages au NW neige —2,5

Itinéraire du camp 4 au camp 5. De 3^h a jusqu'à 10^h a. A partir d'ici, nous sommes sur les skis, de Quervain en tête. D'abord détour vers ENE pour sortir du lac, ensuite montée avec crevasses à 1,5 km leur orientation est-ouest; stratifications visibles, 4 couches égales à 1,5 m, neige 30—40 cm durcie, gelée à la surface. Après 2 km, nouvelle montée de 30—50 m, inclinée vers SW. Là-bas lac à 1 km. A 2,5 km, nous nous trouvons dans un bas-fond, dans un marais gelé, à 2 km d'un lac. A 5^h nous rencontrons une mouette, assise sur la glace (tête noire, cou gris-clair; aile gris-brun). 5^h50. En haut de la montée suivante, grandes crevasses, direction N—S, largeur 3—4 m, couche grise dans glace, pas très distincte, surface ici assez inégale; ondula-

tions de 2—3 m de distance, 10—20 cm de hauteur, provenant plutôt d'anciennes crevasses que du vent. Les traîneaux chavirent souvent. Vers 4^h, la neige devient meilleure, moins désagréable pour les chiens, avec petites traces de neige fraîche. Plus loin surface beaucoup plus unie. Après une descente légère de nouveau une montée légère. Au camp 5, la neige est profonde d'environ 1 m et elle est tout à fait durcie au fond, reposant sur la glace.

26 Juin. Remarques météorologiques. 0^h a. Le vent venant de ENE à E nous frappe, de même la périodicité du vent: un maximum le matin, un minimum l'après-midi. 2^h p. horizon sombre vers W et WNW; là-bas traces de Cumulus. Cirrus avec pôle vers ESE. Nous sommes frappés de ne voir aucune trace de halo; même constatation tous les jours précédents sur l'inlandsis. De même il nous paraît étrange que nous ayons toujours cet air brumeux.

Itinéraire du camp 5 au camp 6. De 5^h10 a à 10^h45 a. Remarques générales: d'abord notre chemin paraîssait horizontal; ensuite successivement trois montées et trois descentes. Au haut de la troisième montée le camp 6. En route fait remarqué: les lacs qui se trouvent toujours à droite de notre itinéraire; en tout leur nombre était de 7. La neige était toujours égale, dure, et gelée; 4 cm d'épaisseur par place, ensuite glace dure. La surface était un peu irrégulière sur les pentes. Au haut des pentes, il y avait aussi des crevasses. Dans les parties basses, la surface assez lisse; la neige commençait à se ramollir entre 8^h et 9^h quand la température de l'air était encore de — 1°. Indications particulières: au km 1,2, au haut de la première montée, crevasses à 45° vers la gauche en avant. Au km 2,1—2,4 visée vers un lac qui se trouve à 1,5 km à droite, long de 2 km. Au km 2,6, nous passons un marais gelé; km 3,6 dans la seconde pente; km 4,3 crevasses comme les précédentes; km dans une descente, après une seconde montée. La montée en arrière est de 3,5 $^0/_0$. La troisième onde du terrain est plus plate et plus allongée. La quatrième montée est plus prononcée. En tout ce sont chaque fois des montées de 30—40 m et plus loin on descend chaque fois de 10—20 m.

27 Juin. Observations météorologiques. Au départ retardé neige déjà un peu molle, le vent fort, augmentant encore beaucoup; tourne du S vers E. A midi, mes camarades disent avoir vu un halo; c'eût été le premier. Pendant toute la nuit du 27 au 28 vent du sud-est violent, qui jette contre la tente des morceaux de neige dure.

Itinéraire du camp 6 au camp 7. 7^h50 a jusqu'à 2^h p. D'abord pendant 2 km montée de 20 m, ensuite grande descente, qui étonne, jusqu'au km 6,3. Ici, à droite du chemin, à 1—2 km de distance, lac gelé, long de 1—2 km. Après montée et descente courte nouveau lac

Date	Heure	Camp	Distance du bord de l'inlandsis et du dernier camp	Hauteur au-dessus de la mer	Pression, mm	Température de l'air	Humidité relative	Tension de la vapeur	Direction du vent	Vitesse du vent, mètre par sec.	Vitesse du vent, mesure intermédiaire	Nébulosité 1-10	Forme des nuages	Direction des nuages	Extrêmes de température et aspect du ciel Précipitation
27 Juin	7.10 a	6	—	1344	644,5	0,4	—	—	ESEzS	8,0	6,7	5	Ci-Cu Ci-Str	S	Min. { air -4,5 neige -3,8
	7.50	6	0	1344	644,0	—	—	—	—	—	—	—	—	—	—
	—	—	2,0	1373	641,5	—	—	—	—	—	—	—	—	—	—
	—	—	3,0	1367	641,9	—	—	—	—	—	—	—	—	—	—
	10.10	—	6,3	1338	644,0	2,3	—	—	—	—	—	—	—	—	—
	—	—	7,8	1342	643,5	—	—	—	—	—	—	—	—	—	—
	2.00 p	7	14,2	1397	638,4	3,4	72	4,2	E	10,0	—	2	Ci	—	—
	4.00	7	**84,7**	1397	638,3	—	—	—	—	—	—	—	—	—	—
	4.55	7	—	1397	—	—	—	—	—	—	an	—	—	—	—
	5.30	7	—	1397	—	—	—	—	SE	12,5	—	—	—	—	6hp: vent 12,4
	7.37	7	—	—	—	—	—	—	—	12,5	11,2	—	—	—	—
	9.15	7	—	1397	640,4	0,9	83	4,1	—	—	11,6	5	Ci-Str	—	—
28 Juin	6.14 a	7	—	1397	638,7	1,0	—	—	ESE	12,5	13,2	—	—	—	Min.: neige -2,0
	6.51	7	—	1397	—	—	—	—	»	11,0	12,1	—	—	—	—
	8.00	7	—	1397	639,4	1,9	77	4,1	»	11,0	11,3	—	—	—	—
	8.54	7	—	—	—	—	—	—	—	10,6	11,2	—	—	—	—
	10.20	7	0	1397	640,5	—	—	—	—	—	—	—	—	—	—
	12.00	—	3,0	1412	640,0	2,7	—	—	—	—	—	—	—	—	—
	2.00 p	—	8,8	1466	636,7	2,3	81	4,4	SE	6,0	—	10	A-Str	—	—
	7.00	8	18,0	1498	636,3	—	—	—	—	—	—	—	—	—	—
	8.19	8	**102,7**	—	—	—	—	—	—	—	an	—	—	—	—
	9.07	8	—	—	—	1,2	93	4,7	ESE	5,0	4,6	8	A-Cu A-Str	still	neige 0,0
	9.48	8	—	—	—	—	—	—	—	—	5,2	—	—	—	—
	10.00	8	—	—	636,4	—	—	—	—	—	—	—	—	—	—
29 Juin	4.20 a	8	—	1498	—	—	—	—	—	—	—	8	A-Cu	—	—
	7.00	8	—	1498	—	—	—	—	—	—	—	5	A-Cu Ci-Str	—	Min. { air -1,2 neige -2,2
	8.20	8	—	1498	636,1	0,9	94	4,7	ESE	5,2	5,2	2	A-Cu Ci-Str	—	s'éclaircit
	9.30	8	0	—	—	—	—	—	—	—	—	—	—	—	—
	11.45	—	—	1562	630,3	1,3	82	4,1	ESE	5,5	—	2	Ci-Cu	—	—
	2.00 p	—	—	1603	626,5	1,9	79	4,2	»	4,4	—	2	A-Cu	—	Ci-nebula, halo
	3.35	9	20,0	1641	—	—	—	—	—	—	—	—	—	—	—
	4.42	9	**122,7**	1641	—	—	—	—	—	—	an	—	—	—	—
	5.00	9	—	1641	622,7	—	—	—	—	—	—	—	—	—	—
	6.48	9	—	—	—	—	—	—	—	—	4,0	—	—	—	—
	9.00	9	—	1641	622,6	—0,9	82	3,5	SE	4,6	—	2	Ci-Str	—	neige —2,0 Ci-Str au NW

sur notre chemin de km 8—10. On tourne à gauche; à son bord marais gelé, aprés montée forte; neige seulement 2—5 cm, surface en partie découverte. En bas au lac, à gauche du chemin, mamelon surprenant, haut de quelques m que nous expliquons comme s'étant formé par la congélation de l'eau d'une source de l'eau filtrant sur le fond de neige et sortant au bas de la pente (Grundwasserquelle). Ensuite sur le plateau, la neige est moins durcie et plus jeune. Là-haut il y a des crevasses perpendiculaires à notre direction; les jeunes sont larges de 10—20 cm.

28 Juin. Remarques météorologiques. 6^h14 a. Ciel clair vers l'est. Il y a un »segment de fœhn«; il est relativement sombre à l'ouest et nord-ouest. Après 8^h, le vent baisse; cela nous permettra de partir. 2^h p. Horizon un peu éclairci vers nord-ouest.

Itinéraire du camp 7 au camp 8. 10^h20 a jusqu'à 5^h p. Tout le voyage dans neige molle, ramollie par le foehn de la nuit dernière. La couverture devient de plus en plus uniforme, mais quelquefois encore neige grise avec parties sales. On s'étonne de rencontrer encore des lacs qui correspondent à des basfonds dont on ne se rend plus bien compte, mais qui sont visibles sur le barogramme (30—40 m); deux lacs à droite du chemin, le premier à km 3, le second à km 12. Au dernier, nous remarquons des lignes de niveau, élevées de quelques m, au bord opposé. Avant ce lac, du km 6 au km 7,5, nous avons rencontré un grand nombre de crevasses, larges de 5—10 m, mais recouvertes de ponts jaunes et gris et enfoncés. Là où les ponts étaient tombés on pouvait observer de la glace à trois couches, dont chacune avait 0,3 à 1 m d'épaisseur. L'angle des crevasses avec notre chemin était de 50° vers la droite en avant. — Au camp 8, la neige est profonde de 40 cm, reposant sur du névé vieux et dur.

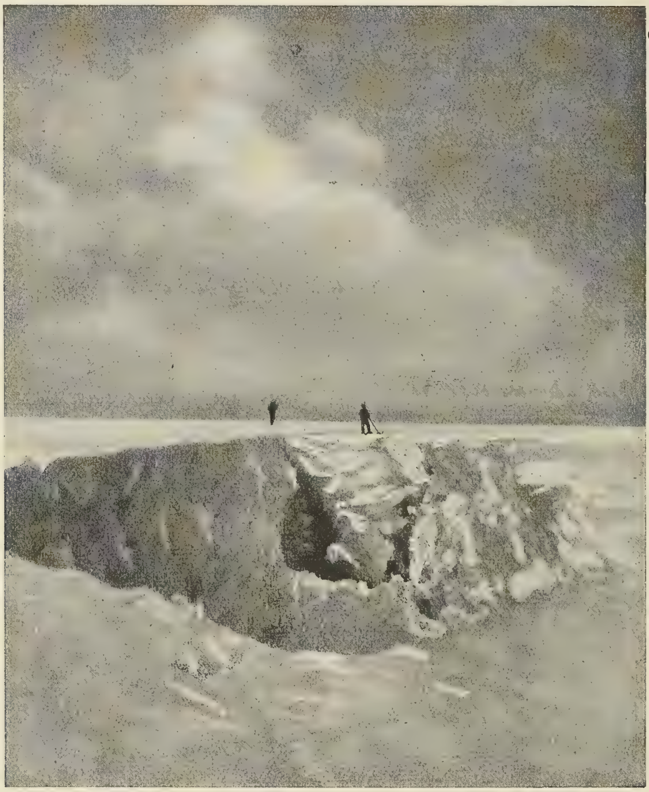
29 Juin. Remarques météorologiques. 2^h p. Pour la première fois, je constate avec certitude un halo.

Itinéraire du camp 8 au camp 9. De 9^h30 a jusqu'à 3^h35 p. Le caractère du paysage a changé. Aujourd'hui nous traversons une seule plaine infinie (qui en vérité montait d'une façon continue); l'horizon tout autour uniforme. Seulement au km 4,3, à gauche du chemin, lac presque gelé et ensuite à peu près du km 16—17, à gauche, quelques élévations plus marquées du terrain qui nous accompagnent. Avant le camp 9, le terrain monte passablement. Au camp 9, nous sommes entourés d'un horizon double, comme si nous nous trouvions sur une colline. Ici 30—40 cm de neige, la glace se trouve dessous.

30 Juin. Remarques météorologiques. Soleil visible. 8^h a. Le vent du sud-est devient presque sud-sud-est au courant de la journée. Je suppose qu'il y a une dépression à l'ouest et nord-ouest.

Itinéraire du camp 9 au camp 10. De km 2,5—5,2 nous arri-

vons dans une région d'énormes crevasses, comme nous en avons rencontré, Mr. Bäbler et moi dans les régions du grand Karajak à environ 80 km du bord. Des ponts de neige larges, enfoncés sur leur bord jusqu'à 1 m. Quelquefois les ponts sont rompus; leur débris se trouvent à une profondeur de 20—30 m, ce qui prouve



Les dernières crevasses de l'inlandsis en arrière de Jakobshavn à 128 km du point de départ et 1660 m d'altitude.
Phot. de Quervain 30 VI 1912.

que les crevasses doivent être très profondes. Les crevasses sont orientées d'abord presque comme notre chemin. Elles deviennent de plus en plus perpendiculaires. A cette direction, leur largeur, prise un peu oblique, à été jusqu'à 45 m. Les ponts eux-mêmes sont stratifiés, avec des stries de glace. Aux parois des grandes crevasses on voit une stratification avec intervalle de 1 à 1,5 m, mais très inégale. — Les montées et les descentes sont difficiles à distinguer dans toute cette région. Avant d'arriver aux grandes crevasses, le chemin descendait d'abord et montait ensuite jusqu'au bord de la zone crevassée. — On rencontrait une seule crevasse large de 1—2 m et tout à fait fermée au km 18 avant le camp 10.

Date	Heure	Camp	Distance du bord de l'inlandsis et du dernier camp	Hauteur au-dessus de la mer	Pression, mm	Température de l'air	Humidité relative	Tension de la vapeur	Direction du vent	Vitesse du vent, mètre par sec.	Vitesse du vent, mesure intermédiaire	Nébulosité 1-10	Forme des nuages	Direction des nuages	Extrêmes de température et aspect du ciel Précipitation
30	8.00 a	9	—	1641	621,9	—0,8	79	3,4	SE	6,3	5,7	10	Ci-Str A-Cu	—	Min. { air -3,3 neige 4,2
Juin	9.40	9	0	1641	621,9	—	—	—	—	—	—	—	—	—	—
	12.00	—	5,2	1661	620,8	0,7	74	3,6	SEzS	6,2	—	5	Ci-Str	—	halo Ci-Str pôle N-S
	1.05 p	—	7,7	1163	620,8	—	—	—	—	—	—	—	—	—	—
	2.00	—	11,8	1668	620,5	0,6	82	3,9	SE	3,6	—	0	A-Cu	—	A-Cu à l'hor W-là bas sombre
	3.00	—	15,3	1723	616,5	—	—	—	—	—	—	—	—	—	—
	4.20	10	18,7	—	—	—	—	—	—	2,9	—	—	—	—	—
	5.29	10	**141,4**	—	—	—	—	—	—	—	an	—	—	—	—
	6.00	10	—	1750	614,9	—	—	—	—	—	—	—	—	—	—
	8.44	10	—	—	613,0	—3,0	87	3,2	SE	4,0	4,2	4	—	—	—
1	0.30 a	10	—	—	—	—4,9	—	—	—	—	5,8	—	—	—	neige —6,0
Juillet	3.15	10	—	—	607,3	—0,3	83	3,7	SE	10,0	9,0	1	A-Cu	im SE	Min. { air -6,0!? neige -6,8
	9.30	10	—	—	606,1	—	—	—	»	10,5	—	—	—	—	—
	9.48	10	—	—	—	—	—	—	—	—	11,0	—	—	—	—
	10.15	10	0	1750	—	—	—	—	—	—	—	—	—	—	—
	12.00	—	5,0	1800	601,2	0,9	89	4,0	SSE	17,0	—	—	—	—	—
	2.00 p	—	10,5	1827	600,0	0,1	90	4,2	SE	12,5	—	10	Schneetreiben	—	tempête de neige
	4.00	11	18,0	1831	599,7	—	—	—	—	—	—	—	—	—	—
	5.08	11	**159,4**	1831	—	—	—	—	—	—	an	—	—	—	—
	6.00	11	—	—	599,6	—	—	—	—	—	—	—	—	—	—
	8.00	11	—	—	599,2	—	—	—	—	—	—	—	—	—	—
	10.15	11	—	—	599,7	—2,4	80	3,1	SSE	11,7	11,6	8	A-Cu	SE	nuages vont très vite

La neige a été ancienne et dure pendant la première partie du chemin. Dans la seconde partie, il y avait de la neige blanche, quelquefois avec neige tout à fait fraîche qui formait placage. Au camp 10, la neige n'a que 20 cm de profondeur. Plus bas, elle était tout à fait dure.

1 Juillet. Remarques météorologiques. Pendant la nuit forte baisse du baromètre et augmentation du vent. Nous supposons un minimum à l'ouest; avec cela, nous sommes dans le soleil. Température dans la tente à 1^h du matin 1°, à 6^h 7°; à 10^h une couche de A-Cu monte du SE; à 11^h p il y a A-Cu 9, venant très vite du SE. Le chemin est

Date	Heure	Camp	Distance du bord de l'inlandsis et du dernier camp	Hauteur au-dessus de la mer	Pression, mm	Température de l'air	Humidité relative	Tension de la vapeur	Direction du vent	Vitesse du vent, mètre par tec.	Vitesse du vent, mesure intermédiaire	Nébulosité 1-10	Forme des nuages	Direction des nuages	Extrêmes de température et aspect du ciel Précipitation
2 Juillet	8.14 a	11	—	1831	599,9	— 2,3	84	3,3	ESE	6,6	7,7	—	—	—	Min. { air -3,0 / neige -4,0
	9.51	11	—	1831	—	—	—	—	SSE	5,3	6,1	—	—	—	—
	10.30	11	0	1831	—	—	—	—	—	—	—	—	—	—	—
	1.10 p	—	9,0	1859	598,1	— 2,3	—	—	SW	6,2	—	10	Ni	—	⊙ perce
	2.00	—	14,0	1868	597,4	— 3,1	92	3,4	»	—	—	10	»	—	* ≡
	4.30	12	23,3	1888	—	—	—	—	—	—	—	—	—	—	—
	5.36	12	**182,7**	1888	596,4	—	—	—	—	6,9	an	—	—	—	—
	6.15	12	—	1888	597,4	—	—	—	—	—	—	—	—	—	—
	9.25	12	—	1888	598,4	— 5,2	—	—	WSW	8,0	7,2	10	Ni	—	—
3 Juillet	8.10 a	12	—	1888	598,1	— 5,7	85	2,5	E	2,7	3,1	—	—	—	Min. : air — 6,8 / neige : dérangé
	11.55	12	0	1888	—	—	—	—	—	—	—	—	—	—	—
	2.00 p	—	6,3	1905	596,9	— 3,9	73	2,5	ESEzS	2,5	—	3	Ci-Str	—	Halo Pole-SSW
	5.00	—	17,0	—	—	— 4,0	—	—	—	—	—	—	—	—	—
	5.40	13	22,0	1936	—	—	—	—	—	—	—	—	—	—	—
	8.45	13	**204,7**	*—*	—	—	—	—	—	—	an	—	—	—	—
	9.00	13	—	1936	591,6	—12,6	78	1,4	C!	0	—	1	Ci-Str A-Str	—	au NW
4 Juillet	8.10 a	13	—	1936	592,4	—12,5	83	1,5	SE	3,1	2,2	0	Fr-Str	—	Min. { air -19,5 / neige -20,0
	11.24	13	—	1936	—	— 9,1	69	1,7	—	—	—	1	Ci	SSE	nuage existe
	12.07	13	0	1936	—	—	—	—	—	—	—	—	—	—	10 h 45 installé actinomètr. Steenstrup
	2.00 p	—	7,1	1967	590,1	— 6,8	75	2,1	ESE	2,4	—	0	∾	—	—
	3.50	—	15,0	1994	588,1	— 4,6	76	2,5	C!	0	—	0	—	—	—
	5.30	—	19,3	2052	583,9	—	—	—	—	—	—	—	—	—	—
	6.30	14	23,5	2046	584,3	— 7,1	69	1,9	C!	0	—	—	—	—	—
	7.11	14	**228,2**	2046	—	— 9,0	78	1,8	—	2,0	an	0	—	—	—
	7.45	14	—	2046	585,1	—	—	—	—	—	—	—	—	—	—
	9.00	14	—	2046	385,0	—12,8	89	—	ESE	3,0	2,7	—	—	—	—

fait avec vent violent du SE, allant jusqu'à 18 m par seconde, le temps devenant de plus en plus sombre.

Itinéraire du camp 10 au camp 11. De 9^h30 à 4^h p. Au commencement de km 1,3—2,5 encore crevasses couvertes de neige; leur direction va vers 60° à droite de la nôtre. Dans une crevasse ouverte on voit la stratification à 5 m de profondeur; le rubannage était très variable, de 0,1—1 m et discontinu. La surface était pendant ce parcours assez inégale et durcie. En général on voit très peu pendant ce temps de

tempête. Nous sommes incertains combien nous sommes montés, parce que la baisse du baromètre a encore duré pendant le jour. Au camp 11, il y a une légère baisse. Il y a 25—30 cm de neige relativement fraîche. Ensuite névés solides jusqu'à 60 cm. Plus bas la pointe du bâton rencontre un névé transformé en glace, ou la glace dure.

2 Juillet. Remarques météorologiques. Entre 11^h et 12^h le vent tourne de SE au S et SW. Le soleil est encore quelquefois visible à travers le nimbus; vers 11^h45, par un chasse-neige on peut encore mesurer approximativement l'angle de hauteur du soleil; à partir de 11^h30 a jusqu'au soir, chûte de neige augmentante. Il fait très brumeux; l'homme à la tête de la colonne est encore visible à 200 ou 300 m.

Itinéraire du camp 11 au camp 12. 10^h30—4^h30 du soir. Le voyage, surtout à partir de 11^h30 se fait presque entièrement dans le brouillard et le chasse-neige; nous voyons très peu de la surface, qui paraît uniforme, d'abord encore irrégulière, avec neige dure, ensuite aplanie par la neige qui tombe. Au km 14, nous risquons de perdre Gaule, qui est en tête; il a perdu la direction et disparaît dans le chasse-neige tout à fait à gauche, et les chiens ne le sentent plus parce que le vent est de travers. Il est très difficile de maintenir la direction. — Sondage au camp 12. A la surface 0—20 cm de neige fraîche poudreuse, ensuite 66 cm de névé; ensuite couche impénétrable de névé ou de glace.

3 Juillet. Remarques météorologiques; Soleil pendant le jour, le soir calme, pour la première fois; et immédiatement la température baisse beaucoup.

Itinéraire du camp 12 au camp 13. 11^h55 a—5^h40 p. La surface rencontrée en route consiste en neige durcie qui est couverte de neige poudreuse 0,5—15 cm. En général, le chemin est très plat, mais on distingue encore des ondes de plusieurs km de longueur; en tout 4 montées qui deviennent, par la disparition et la réapparition de l'homme qui précède la colonne de 500 m à 1 km, visibles, aussi dans le barogramme. D'après celui-ci, la montée la plus forte en 15 minutes, est de 25 m environ. Les plaines sont plus étendues; l'impression que ce sont même quelquefois des descentes tout à fait insignifiantes (environ 5 m) est confirmée en partie par le barogramme. Au km 16, je note des »montagnes« à droite et à gauche; ça veut dire en ce cas, des gonflements de l'inlandsis, qui dépassent la hauteur de notre chemin. — Sondage au camp 13. D'abord 0—20 cm de neige poudreuse, ensuite 50 cm de névé, ensuite glace. — A ce camp, nous croisons la route prétendue des Lapons du baron de Nordenskjöld.

4 Juillet. Remarques météorologiques. Le matin à 8^h 2 cm de givre.

Itinéraire du camp 13 au camp 14. 12^h07 à 6^h30 p. Le chemin, en plein soleil, traverse la neige durcie, couverte de neige fraîche pou-

dreuse, épaisse de 4—5 cm. La surface, comme hier, est très plane, mais il y a quelques ondes (d'après le barographe 3 montées et trois déscentes), qui sont très difficiles à distinguer. Dans la nuit suivante et déjà ce jour, la pression était en hausse. Il est donc douteux, combien les déscentes étaient prononcées; une visée trouve au km 15, en avant 12 $^0/_{00}$ de montée, en arrière 2 $^0/_{00}$ de descente. — Sondage au km 14: d'abord 2 cm de neige poudreuse, ensuite 5—7 cm de neige de consistance granuleuse, ensuite 10 cm de neige très dure avec 2 couches de glace d'une épaisseur d'environ $1^1/_2$ cm et de 6 cm de distance; en

Bivouac enneigé pendant la traversée.

Phot. de Quervain 1912.

tout 35—45 cm. Le bâton ne peut pas pénétrer plus loin dans le névé très dur qu'il rencontre. Densité de la neige à 10 cm: 0,45.

5 Juillet. Remarques météorologiques. Dans la nuit du 4—5 quelquefois vent plus fort; la montée de la pression est remarquable. Dans la matinée quelquefois des coups de vent irréguliers. Vers 2^h p, nous remarquons des cumulus nombreux, petits et clairs. Voyage d'abord au soleil; ensuite nuages venant du sud. Après 4^h tout est gris, soleil disparu.

Itinéraire du camp 14 au camp 15. 11^h45 à 6^h30 p. Sur la surface encore neige fraîche, un peu diminuante et un peu plus dense. Dessous neige dure, mais toujours moins, de sorte que les chiens peuvent bien y marcher. La surface montre encore de grandes vagues du terrain dont le détail est difficile à fixer. Les hommes en tête de la colonne font les indications suivantes: Q.: d'abord plat (en réalité, d'après le barogramme, c'était une montée de 50 m), ensuite descendant. H. indique: d'abord plat, ensuite montant; F. indique: montant, en général plat; G.: difficile à indiquer à cause du temps sombre. D'après

Date	Heure	Camp	Distance du bord de l'inlandsis et du dernier camp	Hauteur an-dessus de la mer	Pression mm	Température de l'air	Humidité relative	Tension de la vapeur	Direction du vent	Vitesse du vent, mètre par sec.	Vitesse du vent, mesure intermédiaire	Nébulosité 1-10	Forme des nuages	Direction des nuages	Extrêmes de température et aspect du ciel Précipitation
5	8.10 a	14	—	2046	586,4	— 8,3	74	1,9	ESE	4,0	4,3	5	Ci-Str	—	∞ Min.: air -13.5 neige -15,1
Juillet	11.06	14	—	2046	586,9	— 5,9	64	2,0	SSE	3,3	—	5	»	NNE	8h 30 A Steenstr. 48
	11.45	—	0	—	—	—	—	—	—	—	—	—	Str-Cu Cu	—	Hor. S, menace.
	1.00 p	—	5,0	2107	583,0	— 6,0	78	2,3	SSW	3,2	—	1	Cu	—	Cu au SE, S, SW
	2.00	—	8,7	2133	581,4	— 5,8	72	2,1	S	3,5	—	5	Str-Cu	C	—
	3.00	—	13,2	2130	581,6	—	—	—	—	—	—	—	—	—	nuages au SSW
	4.30	—	18,3	2162	579,4	— 6,3	—	—	—	—	—	9	Ni * °	—	clair vers NW
	6.30	15	26,5	2176	578,7	— 7,0	—	—	—	—	—	10	»	—	*°° depuis 4h 30
	9.00	15	**254,7**	2176	578,7	— 7,1	88	2,4	? C	1,6	an	10	Ni, Str	—	*° clair. Korig. W
6	8.06 a	—	—	2176	578,8	— 8,1	74	1,9	SE	2,7	2,0	10	Ni	—	Min. { air -9,0 neige -9,0
Juillet	10.57	—	—	2176	577,6	— 6,3	71	2,0	»	4,4	—	10	»	W	9h 30 a A Steenst. 48
	12.00	—	0	2176	—	—	—	—	—	—	—	—	—	—	⊙ perce p. mom.
	2.00 p	—	7,0	2192	575,5	— 7,3	—	—	S-SSW	5,0	—	10	Ni	—	⊙ perce
	5.10	—	14,5	2226	572,2	—	—	—	—	—	—	—	—	—	—
	7.04	16	25,3	2243	570,4	— 8,6	78?	1,9	SE	3,3	an	9	A-Cu	S	—
	8.15	16	**280,0**	2243	570,0	—	—	—	—	—	—	—	—	—	—
	9.00	—	—	2243	569,6	—10,9	95	1,9	SE	3,6	3,1	10	A-Cu Ci-Str	—	Ci-Str à Hor. S
7	7.32 a	—	—	2243	566,2	— 7,1	95	2,6	SE	10,0	7,3	9	Ni	—	Mín. { air- 14,2 neige 15,8
Juillet	12.33	—	—	—	—	—	—	—	»	11,0	11,8	8	—	—	—
	2.00 p	—	—	2243	566,8	— 5,3	86?	2,6	»	11,0	—	10	—	—	—
	3.08	—	—	—	—	—	—	—	—	—	10,8	10	—	—	—
	8.31	—	—	2243	569,3	— 7,9	88	2,2	—	—	?	9	A-Str	S	—

le barogramme, c'était 3 montées; entre-deux des parties horizontales ou déscendantes tout au plus de quelques m. — Sondage au camp 15: 0,5 cm de neige fraîche, ensuite 5 cm de neige moins dense, un peu granuleuse, ensuite 8 cm d'une couche de glace; ensuite névé dense, granuleux. Le bâton pénètre jusqu'à 45—72 cm; ensuite névés très durs ou glace.

6 Juillet. Remarques météorologiques. Depuis hier $^1/_2$ cm de neige fraîche; le vent, après 12^h tourne très vite du SE vers S et SSW, ensuite, vers la soirée, il retourne au S et SE.

Itinéraire du camp 15 au camp 16. 11^h45 a à 7^h04 p. Parti

Date	Heure	Camp	Distance du bord de l'inlandsis et du dernier camp	Hauteur au-dessus de la mer	Pression, mm	Température de l'air	Humidité relative	Tension de la vapeur	Direction du vent	Vitesse du vent, mètre par sec.	Vitesse du vent, mesure intermédiaire	Nébulosité 1-10	Forme des nuages	Direction des nuages	Extrêmes de température et aspect du ciel Précipitation
8 Juillet	8.08 a	16	—	2243	570,6	— 8,7	73	1,7	SE	5,4	6,3	1	Ci-Str A-Cu	ESE	direction des A-Cu
	10.00	16	—	2243	570,4	— 6,3	69	2,0	»	6,3	6,0	1	A-Cu	—	10h30A.Steenstr. 58
	12.00	16	0	2243	—	—	—	—	—	—	—	—	—	—	—
	2.00 p	—	6,0	2265	567,9	— 5,0	72	2,3	ESEzE	6,3	—	0	—	—	∞^2
	3.40	—	13,5	2283	566,2	—	—	—	—	—	—	—	—	—	—
	6.25	17	26,5	2318	563,1	— 8,1	72	1,8	E	5,4	—	0	—	—	—
	0.03	17	**306,5**	2318	562,8	—12,9	79	1,4	—	4,5	an	2	A-Str	i. NW	∞ camp 11h30p-8,0
9 Juillet	8.00 a	17	—	2318	563,4	—11,4	70	1,4	ESEzE	4,8	5,3	0	—	—	∞^2
	10.31	17	—	—	—	— 6,6	64	1,9	—	4,9	5,5	—	—	—	10h a Aetinom.: 48
	11.15	17	0	2318	—	—	—	—	—	—	—	—	—	—	—
	12.25 p	—	4,0	2336	562,1	— 4,6	78	2,5	SE	5,7	—	—	—	—	—
	2.00	—	8,0	2341	561,7	—	79	—	»	6,0	—	0	—	—	—
	3.00	—	12,5	2354	560,8	— 4,1	—	—	—	7,1	—	—	—	—	neige sur la côte
	3.45	—	16,0	—	—	— 4,9	—	—	—	—	—	—	—	—	—
	5.00	—	21,7	2374	559,3	— 5,7	—	—	—	—	—	—	—	—	—
	6.00	—	24,0	2385	558,5	— 6,9	—	—	E	—	—	—	—	—	—
	7.00	18	31,5	2399	557,5	— 8,7	86	2,1	—	2,9	—	—	—	—	—
	7.30	18	**338,0**	2399	—	—	—	—	—	—	an	—	—	—	—
	9.00	18	—	2399	557,8	—11,8	91	1,7	E	2,9	3,1	1	Ci-Str A-Cu 0	—	neige: —13,0 ∞^2
	11.45	18	—	—	—	—13,0	—	—	—	—	—	—	—	—	—

par temps sombre et brumeux. Le vent variable rend très difficile le maintien de la direction. Après 4^h cela va mieux parce que le temps s'éclaircit un peu. Surface: la neige fraîche ne se distingue bientôt plus des couches inférieures; couche assez uniforme de neige poudreuse, ensuite couche plus dense, qui porte en général les chiens. La surface paraît monter continuellement (d'après le barogramme, il y aurait deux montées un peu plus prononcées). L'inlandsis nous apparaît comme un océan, sans les moindres différences à l'horizon. — Sondage au camp 16: 5—12 cm de neige poudreuse, ensuite 12 cm de névé, passant un peu à la glace, plus bas neige profonde, bien comprimée. Le bâton s'arrête à 85—120 cm de profondeur.

7 Juillet. Remarques météorologiques. Pendant la nuit tempête du sud-est avec fort chasse-neige et montée de température; commençait probablement déjà vers 3^h a. Soleil reste visible à

travers chasse-neige et peut-être neige tombante. — Derrière la tente, des amas de neige, hautes de 1 m, se forment. Un chien y périt. Vers 12^h on peut déterminer la latitude malgré le chasse-neige. Après 3^h le ciel est couvert, A-Cu et Ci dense? Vers 8^h30 p, le temps s'éclaircit à l'ouest, le vent tombe lentement.

Première journée de repos depuis que nous avons quitté le bord de l'inlandsis. Travaux de réfection

8 Juillet. Remarques météorologiques. Pendant la nuit, la tempête diminue; les thermomètres extrêmes n'ont pas été exposés de peur de les perdre. Dans la tente minimum nocturne: —11°,5. Le voyage s'effectue par temps clair. Nous sommes frappés de voir que le vent vient de tourner un peu vers l'est.

Itinéraire du camp 16 au camp 17. 12^h a à 6^h25 p. (Retardé parce qu'il a fallu déblayer les chiens et les traîneaux ensevelis dans la neige). Surface: Dans la tempête de la dernière journée, la neige a été comprimée; la surface primitive est déblayée en partie. Cette surface consiste aussi en neige très fine. La neige fraîche forme en partie des dunes petites de 12—15 cm de haut, imitant en partie les rides du sable qu'on trouve au bord de l'eau (ripple-marks). La surface monte continuellement, sans qu'on s'en rende compte et sans qu'on remarque des ondulations du terrain. Le barogramme confirme cette impression. — Sondage au camp 17: 3—12 cm de neige poudreuse dense, ensuite 15 cm d'une couche transformée en glace, ensuite neige poudreuse comprimée, déscendant jusque vers 90 cm, ensuite couche solide impénétrable, mais pas de glace.

9 Juillet. Remarques météorologiques.

		Températures de la neige, 0,5cm	3 cm	18 cm	
Mesuré à l'ombre d'un bâton	(3^h p:	— 3,9°	— 5,2°	— 7,0°	
en route	(6^h:	— 7,5	— 7,8	— 8,2	(12 cm)
au camp 18	(7^h30:	— 9,5	— 9,2	— 8,5	(10 cm)
	(9^h:	—12,0	—11,6	— 9,0	

Itinéraire du camp 17 au camp 18. 11^h15 a à 7^h p. Surface primitive durcie, très plane; en maint endroit couverte de neige fraîche ondulée, profonde de 1—10 cm. La montée est uniforme; on ne peut pas la remarquer directement. L'horizon paraît plus rapproché qu'il n'est sur la mer. Du côté du soleil il paraît le plus éloigné. — Sondage au camp 18: neige poudreuse fixée par le vent 0—4,5 cm; ensuite neige durcie 15 cm, ensuite neige poudreuse dense jusqu'à 64—68 cm au-dessus de la surface; plus bas couche dure qui ne peut-être traversée. Densité de la neige poudreuse inférieure 0,44.

10 Juillet. Remarques météorologiques. La marche de la température nocturne est constatée; les mesures de température nocturne sont continuées:

	air	surface	0,5 cm	3 cm	18 cm	50 cm
8^h00 a:	—11,5°	—10,5°	—11,0°	—11,2°	—11,5°	—
10^h00:	— 8,9	— 6,5	—	—	—	— 8,5°
12^h00:	— 7,2	—	— 5,0	— 6,0	— 7,7 (10 cm)	—
2^h00 p:	— 6,1	—	— 2,0	— 3,5	— 7,0	—
2^h50:	— 6,6	—	— 5,0	— 5,2	—	—
4^h10:	— 7,1	—	— 5,5	—	—	—
6^h00:	— 8,4	—	— 9,5	—	—	—

Le calme de l'après-midi frappe beaucoup. Au soleil c'était directement chaud, le temps était tout clair, mais toujours brumeux!

Itinéraire du camp 18 au camp 19. 10^h50 a à 6^h p. Le chemin passe par une plaine de neige durcie, avec des amas de neige insignifiants, hauts de 1—10 cm, durcis par le vent. Vers 2^h50, au km 16,8, on peut sonder jusqu'à 60—80 cm. Le chemin est toujours montant, mais l'œil s'en aperçoit à peine. Dans l'après-midi, au km 12,2, nous remarquons (rendu attentifs par les chiens) deux mouettes qui volent vers l'est et une autre, désignée par Fick comme »Raubmöve«, qui s'asseoit sur la neige. — Sondage au camp 19: neige poudreuse, solide, plus dense à la surface; dans la profondeur, elle devient aussi de plus en plus dense, jusque vers 63—80 cm. La résistance augmente vers la profondeur graduellement et non subitement, comme c'était le cas jusqu'ici. Densité de la neige à 20 km 0,42.

11 Juillet. Remarques météorologiques. Les minima de température ont eu lieu avant 2^h35 de la nuit. Les thermomètres extrêmes étaient en ce moment déjà en hausse lente. — Température dans la tente: à 0^h51 a: —15°, 2^h35 a: —13°, 9^h23 a: +22°! Un vent de l'ouest-nord-ouest commence environ à 1^h. Nous le considérons, malgré la montée qui continue, comme un signe d'approche vers la côte de l'est. Après 6^h p ont voit apparaître au-dessus de l'horizon est des couches de brouillard blanc qui menacent les excursions prévues pour le jour suivant perpendiculairement à notre itinéraire.

Itinéraire du camp 19 au camp 20. 11^h a à 5^h35 p. Le chemin se fait par beau temps. La neige est moins uniforme que hier; aux amas dirigés sud-est se joignent maintenant d'autres, dirigés ouest-est. On ne peut plus remarquer de montées. (Cette étape est moins longue parce que la neige était moins régulière et parce que les chiens ne sentaient plus l'homme qui précédait). — Sondage au camp 20: en haut 20 cm de neige dense, plus bas neige poudreuse, moins dense d'abord, ensuite devenant plus dense. Le sondage descend jusqu'à 55—70 cm.

Date	Heure	Camp	Distance du bord de l'inlandsis et du dernier camp	Hauteur an-dessus de la mer	Pression, mm	Température de l'air	Humidité relative	Tension de la vapeur	Direction du vent	Vitesse du vent, mètre par sec.	Vitesse du vent, mesure intermédiaire	Nébulosité 1-10	Forme des nuages	Direction des nuages	Extrêmes de température et aspect du ciel Précipitation
10 Juillet	1.30 a	18	—	—	—	—14,5	—	—	—	5,4	4,9	—	—	—	neige —16,0
	2.30	18	—	—	—	—14,7	—	—	—	—	—	—	—	—	—
	3.15	18	—	—	—	—14,7	—	—	—	5,3	—	—	—	—	—
	5.15	18	—	—	—	—13,6	—	—	—	5,6	—	—	—	—	—
	8.00	18	—	2399	558,3	—11,5	80	1,5	E	4,5	5,4	0	—	—	Min. { air -15,0, neige -16,0
	10.12	18	—	—	—	— 8,9	78	1,8	—	3,6	4,2	—	—	—	9 h 10 Actinom. : 54
	10.50	18	0	2399	—	—	—	—	—	—	—	—	—	—	—
	12.00	—	2,7	2398	557,8	— 7,2	—	—	—	3,3	—	—	—	—	—
	2.00 p	—	12,2	2417	556,2	— 6,1	—	—	—	1,7	—	0	—	—	∞
	2.50	—	16,8	2425	555,6	— 6,6	—	—	C!	—	—	—	—	—	—
	4.10	—	24,7	2441	554,2	— 7,1	—	—	C!	—	—	—	—	—	—
	6.00	19	32,8	2457	552,7	— 8,4	—	—	WNW!	1,0	an	—	—	—	—
	7.00	—	**370,8**	2457	552,7	—	—	—	—	—	—	—	—	—	—
	9.00	—	—	2457	552,5	—14,1	—	—	NE	1,5	0,5	0	Ci?	—	à W Ci?
11 Juillet	0.51 a	19	—	2457	—	—19,5	95	0,9	NE	2,0	1,4	—	—	—	neige —21,0
	2.35	—	—	—	—	—21,4	88	0,7	—	1,7	1,0	—	—	—	» —21,0 air —20,9
	7.15	—	—	—	—	—16,4	72	0,9	—	—	—	—	—	—	neige —13,0
	8.15	—	—	2457	551,0	—14,6	69	1,0	ENE	4,3	1,0	0		—	Extrs. { air -21,7, neige -22,4
	9.30	—	—	—	—	—12,1	65	1,2	»	4,0	3,1	0		—	neige à 0,5 cm -10,5
	11.00	—	0	2457	—	—	—	—	—	—	—	—	—	—	10 h a Actinom. : 54
	12.00	—	2,7	2470	549,3	— 9,0	68	1,6	—	—	—	—	—	—	—
	2.00 p	—	11,6	2470	548,9	— 8,4	73	1,8	WNW!	3,5	—	—	—	—	neige à 0,5 cm -6,4
	3.00	—	16,4	—	—	— 8,7	—	—	—	—	—	—	—	—	—
	4.00	—	21,3	2488	547,3	— 9,1	—	—	N	4,2	—	—	—	—	—
	5.35	20	27,9	2491	546,8	—10,1	—	—	»	4,0	an	0	—	—	brouillardsbl. W-Hor.
	9.56	20	**398,7**	—	546,9	—14,6	90	1,4	NE	3,1	—	0		—	neige —15,5

12 Juillet. Remarques météorologiques. A 9h54 commence chasse-neige et chute de neige; les excursions sont devenues impossibles. Le chasse-neige va en augmentant pendant toute la journé.e

Itinéraire du camp 20 au camp 21. 11h50 a à 10h10 p. La surface n'est pas bien différente en comparaison de la précédente. De nouveaux amas de neige se forment. A la fin, les chiens s'enfoncent jusqu'à 10 cm, mais en général on ne voit et ne remarque rien par ce chasse-neige; il est très fort, jusqu'à 0,5—1 m de hauteur par moments. Un homme disparaît entièrement à une distance de 20—40 m. Le plus souvent on voit tout juste la tête et les épaules à une distance

Date	Heure	Camp	Distance du bord de l'inlandsis et du dernier camp	Hauteur an-dessus de la mer	Pression, mm	Température de l'air	Humidité relative	Tension de la vapeur	Direction du vent	Vitesse du vent, mètre par sec.	Vitesse du vent, mesure intermédiaire	Nébulosité 1-10	Forme des nuages	Direction des nuages	Extrêmes de température et aspect du ciel Précipitation
12 Juillet	7.55 a	—	—	—	546,0	—11,4	87	1,7	ESE	4,5	3,5	8	A-Cu rapides	S	Extrs. { air -21,5 neige -22,0
	9.54	—	—	2491	546,3	— 7,8	90	2,3	SSE	10,0	—	5	Str-Cu ∾	—	vent fort et neige
	11.50	—	0	2491	—	—	—	—	—	—	—	—	—	—	2h p Actinomet. : 50
	1.45 p	—	6,0	—	546,6	— 7,1	—	—	S	8,7	—	10	Ni	—	brumenx vent fort et neige
	6.10	21	20,7	2501	549,8	— 8,6	—	—	ESE	8,4	—	10	»	—	chasse-neige n.
	7.43	—	**419,4**	—	—	—	—	—	—	—	an	—	—	—	—
	9.00	—	—	—	549,8	— 9,1	—	—	ESE	8,0	6,9	10	Ni	—	fort chasse-neige
13 Juillet	8.45 a	—	—	—	551,0	— 8,8	86	2,0	ESEzS	2,9	—	2	A-Cu	S	Min. : air 10,5
	10.00	—	—	—	551,0	— 8,9	74	1,7	ESE	1,6	3,7	5	»	—	givre 3 mm
	11.20	—	0	—	—	—	—	—	—	—	—	—	—	—	10h a Aetinomet.: 56
	2.00 p	—	7,4	2476	552,4	— 3,3	62	2,2	WNW		—	9	A-Cu	WNW	⊙ fort. trans.
	6.30	22	20,2	2432	—	—	—	—	—	—	—	—	—	—	—
	7.25	—	**439,6**	—	555,2	— 7,6	—	—	NW	—	—	9	A-Str A-Cu	—	E u. SE bleu
	9.00	—	—	—	555,5	— 8,9	95	2,2	»	7,7	7,0	10	»	—	à NW un pen plus clair
14 Juillet	8.05 a	22	—	2432	560,8	—10,1	—	—	WNW	7,4	7,4	9	A-Cu A-Str	—	chasse-neige ⊙ visible
	1.00 p	22	0	2432	—	—	—	—	—	—	—	—	—	—	1h a Aktinom. inst.
	5.45	—	15,0	—	—	—	—	—	—	—	—	—	—	—	—
	8.00	23	23,0	2258	—	—	—	—	—	—	—	—	—	—	—
	8.30	23	**462,6**	2258	566,9	—	—	—	—	—	—	—	—	—	—
	9.00	—	—	2258	566,6	—13,3	84	1,4	NNW	6,6	—	0	—	—	∞ faible chasse-neige
	9.45	—	—	—	—	—	—	—	—	—	an	—	—	—	—

de environ 100 m, de sorte que le chemin que nous avons fait était une bonne étape. — Les uns disent que nous sommes montés, les autres disent que nous sommes descendus. Le baromètre indique une montée de 3 m, mais ce n'est pas définitif. — Sondage au camp 21: la couche rendue plus dense par le vent n'existe plus que partiellement à la surface. Jusqu'à une profondeur de 52 cm, elle est uniformément dense et poudreuse.

13 Juillet. Remarques météorologiques. Mesure du minimum de la surface dérangée par les chiens. Terme de l'observation du matin retardé à cause de la constatation que l'horizon descend vers le sud-est. Le matin 3 mm de givre. — Le chemin se fait d'abord avec soleil, assez

visible à travers A-Cu, et air calme. Impression de chaleur; neige presque dégelant. Ensuite A-Cu plus dense, seulement l'horizon de l'est et du sud-est reste clair; un vent léger, mais augmentant de l'ouest-nordouest commence.

Itinéraire du camp 21 au camp 22. 11^h20 a à 6^h30 p. Etat de la neige: les traîneaux ne vont pas très bien; il y a en dessous une couche très peu dense; la couche supérieure se rompt avec un son sourd. Nous ne pouvons pas rester sur les traineaux; nous nous tenons en skis à côté ou devant eux. Ainsi, on peut avancer. A la fin, il devient difficile de prendre la direction à cause de la lumière monotone. Surface: descente effective, environ 60 m, ne se remarque pas directement. Camp 22 pas de sondage.

14 Juillet. Remarques météorologiques. Nous partons avec fort chasse-neige de NW. Il diminue lentement vers le soir. — La lecture de midi est omise, parce que les cordes des voiles sont fixées autour de la caisse des instruments.

Itinéraire du camp 22 au camp 23. 1^h p à 8^h p. Le vent du nord-ouest est utilisé pour attacher les deux derniers traineaux et les faire marcher à voile. Neige: au-dessous elle est très peu dense, couverte de couches durcies, mais qui ne portent pas bien; les chiens s'enfoncent; au-dessus un peu de neige fraîche poudreuse. La neige est toujours chassée. De temps en temps, des amas jusqu'à 40 cm de haut à travers de notre chemin. Topographie: vers la fin du chemin, on remarque la descente; les traîneaux qui tiennent la tête se présentent dans un creux apparent. En correspondance l'horizon du camp 23 montre en arrière une montée prononcée (35 minutes), en avant une plaine horizontale. Nous avons donc déjà atteint la partie ondulée du versant est. — Sondage au camp 23. En haut, neige poudreuse, 10—16 cm: ensuite couche durcie de 8 cm. A 62 cm arrêt subit du bâton, probablement seconde couche durcie. Densité moyenne 0,44.

15 Juillet. Remarques météorologiques. Jusqu'à midi »très chaud«; plus tard Ci-Str; toujours plus denses. A la fin, à partir d'environ 4^h30, le chemin pour ainsi dire invisible. Vers 4^h p il commence à neiger, et le vent faible tourne du NW vers N à NE, E, et enfin SE à 7^h. Vers 9^h il devient un peu plus clair, la neige cesse, l'horizon est visible, le vent tourne vers W, NW et devient plus fort.

Itinéraire de camp 23 au camp 24. 12^h20 à 7^h10 p. Le vent du nord-ouest est trop faible pour mettre à la voile. Neige: toujours couche mince durcie, qui se rompt avec un son sourd et s'abaisse de quelques mm. Topographie: on ne peut guère en juger, puisqu'on voit à peine les pointes des skis. Le barographe monte à partir de km 4,5 jusqu'à km 5,2; une première descente d'environ 25 m, et entre km 12 et 24, une seconde descente continue d'environ 50 m. — Sondage

Date	Heure	Camp	Distance du bord de l'inlandsis et du dernier camp	Hauteur an-dessus de la mer	Pression, mm	Température de l'air	Humidité relative	Tension de la vapeur	Direction du vent	Vitesse du vent, mètre par sec.	Vitesse du vent, mesure intermédiaire	Nébulosité 1-10	Forme des nuages	Direction des nuages	Extrêmes de température et aspect du ciel Précipitation
15	8.08 a	—	—	—	—	—12,1	75	1,4	NNW	4,5	5,3	0	∾	—	pl. tard A-Cu
Juillet	10.51	—	—	2258	570,1	— 8,1	71	1,8	»	3,5	6,0	2	—	—	airmin. -17,4
	12.20 p	—	0	2258	—	—	—	—	—	—	—	—	—	—	11 h a Actinom.: 42??
	2.00	—	5,0	—	571,8	— 5,7	63	1,9	—	—	—	7	Ci-Str A-Cu	—	pl. clair vers l'E.
	7.10	24	19,0	2254	—	—	—	—	SE	—	—	—	—	—	—
	9.00	24	**481,6**	2254	575,2	— 5,3	—	—	C	0	—	10	—	—	—
	10.04	—	—	—	—	—	—	—	—	—	an	—	—	—	—
16 Juillet	8.20 a	—	—	2254	579,1	1,2	94	—	NNW	4,0	2,6	5	Ci-Str A-Cu	W	neige min. 4,2
	10.06	—	—	2254	579,3	1,3	95	—	—	3,4	3,4	—	—	—	9h 30a Actinom.: 46
	11.15	—	0	2254	—	1,8	—	—	—	—	—	—	—	—	neige —0,0 à 8 cm —0,7
	12.00	—	3,0	2238	580,5	1,5	91	—	WNW	3,6	an	—	A-Cu	WNW	assez vite
	2.00 p	—	3,0	—	—	1,3	90	—	NW	4,3	4,2	—	Str Cu A-Cu	—	—
	3.40	—	3,0	2238	581,0	0,9	83	—	—	—	—	9	A-Cu A-Str	—	clain E- u. SE. Hor
	5.25	—	3,0	—	—	—	—	—	—	—	—	—	—	—	—
	7.00	—	8,0	—	—	0,9	—	—	—	—	—	—	—	—	neige —0,0
	8.30	—	13,5	2151	—	0,6	—	—	—	—	—	—	—	—	s'éclaircit
	10.10	—	21,0	—	—	— 1,1	—	—	—	—	—	—	serein	—	—
	12.00	25	28,0	2084	—	—	—	—	—	—	—	—	—	—	—

au camp 24: en haut, il y a 15—25 cm de neige mouillée, alors qu'au soir du 15, elle était encore poudreuse; ensuite couche transformée en glace de 11 cm. Vers 66—86 cm, on rencontre une couche dure, impénétrable; densité à la profondeur moyenne: 0,40.

16 Juillet. Remarques météorologiques. Montée remarquable de la pression pendant la nuit. A la détermination de la longitude 6^h50 a, soleil moitié voilé par A-Cu. Vers midi, la neige devient molle. Vers 6^h30 p et 8^h30 p, le temps s'éclaircit; la surface gèle immédiatement. Nous nous étonnions combien le temps est resté chaud aujourd'hui, et en général, combien il fait chaud.

Itinéraire du camp 24 au camp 24 a et camp 25. De 11^h15 à 12^h et de 5^h25 du soir jusqu'à minuit. La neige molle, rencontrée le matin, nous oblige à une halte intermédiaire (= 24 a) qui dure de

12^h—5^h25 p. La neige est restée molle jusqu'à 6^h30 p. Surface: maintenant on a l'impression qu'elle descend plus fort; peu avant camp 25 (environ 25 m en 10—15 minutes, d'après le barogramme; ce dernier indique pour le reste une descente assez continue, interrompue de parties horizontales de km 5—8 et de 16,5—20). — Sondage au camp 25: 6 cm de neige superficielle, mouillée; ensuite 12 cm de neige transformée en glace; plus bas 50 cm de neige peu dense avec partie durcie. A 65 cm au-dessous de la surface, on rencontre une couche de glace très dure à une profondeur moyenne. Densité: 0,44.

17 Juillet. Remarques météorologiques. Thermomètre extrême exposé seulement à 2^h30. A 2^h ou 8^h14 du matin, températures de la neige à 0,5 cm: —1,8°, 3 cm: —2,0°, 10 cm: —3,0°. Pendant la matinée il reste brumeux. Un thermomètre exposé sur un drap noir monte à 31° à l'air libre. Pendant la nuit, on a toujours un vent faible du NW. Au ciel nord, le soleil se couche entre 10^h30 p et 1^h30 a sous l'horizon; il y a une coloration claire, cramoisi à rouge-brun et qui montre des raies horizontales très fines. Le soleil levant est à peine visible et déformé.

Itinéraire du camp 25 au camp 26. Du 17, 8^h p au 18, 3^h30 a. La neige molle du jour nous oblige dès maintenant de voyager de nuit; ça dérange quelque peu les moments des observations. Départ avec vent faible du NW, et neige qui se durcit de plus en plus et qui finit par porter les chiens. État de la surface: la descente est évidente, pas uniforme, mais en vagues; en tout cas, on peut distinguer 3—4 de ces vagues dans la seconde partie de l'itinéraire. Au camp 26, surface relativement plane; vers km 16 peut-être traces de crevasses, couvertes par la neige? A 8^h45, M. Fick, le premier, voit la terre. (Sommet à l'horizon). Vers 9^h30 azimut magnétique de ce sommet = 131°,5; au camp 26, c'est 122°,7. (Voir le panorama pris au camp 26), ça doit être une région qui ne se trouve pas sur les cartes. Je ne m'y attendais pas dans cette direction est et nord-ouest. — Sondage au camp 26: couche de neige supérieure granuleuse; couche de glace à 12—26 cm. Plus bas, neige granuleuse avec plusieurs couches irrégulières en glace. A 70—95 cm glace solide, impénétrable. Densité à la profondeur moyenne 0,48.

18 Juillet. Remarques météorologiques. La nécessité de dormir fait changer le terme du matin et celui de midi. Dérangement par suite d'indisposition de Q.

Itinéraire du camp 26 au camp 27. Du 18, 10^h p au 19, 4^h a. Le chemin était assez uni. Vers la fin, il y a à la surface une couche de cristaux de neige détachés d'environ 2 mm. Surface: pendant la descente il y avait 6—7 vagues de terrain, dont une suffisamment forte pour que les skis aillent presque d'eux-mêmes. Nous avons l'impression de nous enfoncer dans un entonnoir. Au pied de ces gradins, les mon-

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17	0.15 a	25	—	2084	—	— 3,1	—	—	—	—	—	—	serein	—	—
Juillet	2,30	—	—	2084	591,9	— 4,6	95	3,1	NW	3,5	an	—	—	—	—
	8.14	—	—	2084	593,6	+ 1,8	80	—	»	3,9	4,0	2	Ci-Str	E	lents
	11.30	—	—	2084	593,3	—	—	—	—	—	—	—	—	—	Min. {air -5,2; neige -4,5
	2.00 p	—	—	2084	593,1	2—9	86	—	NW	4,1	2—9	1	A-Str	—	A-Str i. W., ∞
	6.00	—	—	—	—	0,5	—	—	—	—	—	—	—	—	6h 30p Actinom.: 52
	7.00	—	—	2084	592,1	— 0,3	94	—	NW	5,0	3,9	0	—	—	—
	8.00	25	0	2084	—	—	—	—	—	—	—	—	—	—	—
	9.00	—	7,4	2062	593,7	— 1,6	—	—	NW	3—4	—	—	—	—	—
	11.00	—	17,3	—	—	— 2,8	—	—	—	—	—	—	—	—	—
18	2.00 a	—	34,0	—	—	— 3,6	—	—	—	—	—	—	—	—	neige —4,5
Juillet	3.30	26	42,0	1861	608,3	—	—	—	—	—	—	—	—	—	—
	4.13	26	**551,6**	1861	—	—	—	—	NW?	4,8	an	—	—	—	—
	6.00	—	—	—	—	— 2,1	83	3,3	—	—	—	—	—	—	—
	3.06 p	—	—	—	—	1,1	57	—	C	0	3,2	9	Ci-Str	SE	plus tard Ci-Cu du SE
	4.00	—	—	1861	607,8	—	—	—	—	—	—	—	—	—	ds la tente 22°
	8.18	—	—	1861	608,2	—	—	—	—	—	—	—	—	—	6h 30p Actinom.: 54
	8.45	—	—	—	—	— 1,8	88	—	—	—	0,4 ?	2	A-Cu	—	—
	10.00	—	0	1861	—	—	—	—	—	—	—	—	—	—	—
	11.00	—	7,0	1797	612,3	— 4,9	—	—	—	—	—	2	A-Cu Ci-Cu	—	—

tagnes à gauche disparaissent tout à fait. Au courant de ce voyage, la montagne que nous avons appelé »Schweizerland« au dernier camp, montre de plus en plus ses parties inférieures, bien que très loin à l'horizon. De même apparaîssent de plus en plus les montagnes qui sont plus en avant du grand Sermilikfjord, probablement jusqu'au Kingorsùak; l'inlandsis court horizontalement jusque vers le »Schweizerland«, ensuite il s'avance vers nous dans une descente monumentale dans la direction du fjord. Dans cette partie, il y a plusieurs nounataks plus ou moins grands. Quelquefois ont voit aussi les têtes de rochers qui doivent border le fjord de notre côté. Les montagnes du »Schweizerland« sont tout à fait enneigées, par opposition aux montagnes qui commencent avec le point 12 plus au sud-est, qui sont presque noires ou qui portent de la neige ou du névé seulement sur le sommet. Dans

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19 Juillet	1.00 a	—	20,4	1687	620,6	— 4,7	—	—	—	—	—	3	A-Cu Ci-Str	—	—
	3.00	—	36,0	1551	631,3	—	—	—	—	—	—	—	—	—	—
	5.00	27	45,2	1465	—	—	—	—	—	—	—	—	—	—	—
	5.30	27	**596,8**	1465	—	— 0,5	90	—	WNW	3,2	an	9	Ci-Str A-Str	—	—
	9.30	27	—	1465	—	2,1	79	—	»	2,8	3,1	7	»	—	—
	12.20 p	27	—	1465	637,5	2,7	75	—	»	2,8	2,7	10	A-Str A-Cu	—	—
	2.10	27	—	1465	636,7	2,3	88	—	»	3,1	2,8	9	A-Str	—	9h p Actinomet.: 56
	9.00	27	—	1465	637,9	0,9	97	—	NW	1,7	0,7	9	A-Cu Ni	ESE	Ni au S
	10.07	27	0	1465	—	—	—	—	—	—	—	—	—	—	—
20	0.15 a	—	8,5	1470	638,2	— 0,1	—	—	—	—	—	2	A-Cu	—	neige —1,0 à 5 cm 0,0
Juillet	2.55	—	19,5	1378		0,1	—	—	—	—	—	—	—	—	neige —1,5
	3.45	—	24,0	1344	647,5	—	—	—	—	—	—	—	—	—	—
	4.45	28	28,7	1236	—	—	—	—	—	—	—	—	—	—	—
	7.00	28	**625,5**	1236	656,0	2,1	79	—	NW	5,0	—	—	—	—	—
	12.06 p	28	625,5	1236	—	2,3	78	—	»	4,0	4,9	—	—	—	4h p Actinomet.: 48
	3.20	28	625,5	1236	660,1	2,3	74	—	NNW	3,3	2,9	0	—	—	∞
	8.50	28	625,5	1236	661,9	0,5	90	—	NW	2,9	2,9	0	Ci	NW	—
	9.30	28	0	1236	—	—	—	—	—	—	—	—	—	—	—
21	2.00 a	29	13,0	822	—	—	—	—	—	—	—	—	—	—	—
Juillet	3.00	29	**638,5**	822	697,3	3,1	—	—	—	—	—	3	Ci-Str	—	—
	12.00	—	—	—	—	—	—	—	—	—	—	5	»	—	halo
	2.00 p	—	—	—	—	—	—	—	—	—	—	10	A-Str	—	Actinomet. pas obs.
	4.50	—	—	822	700,1	—	—	—	—	—	—	—	—	—	gouttes de pluie
	9.00	—	—	822	698,3	4,7	62	3,9	—	—	—	9	A-Str Ci-Str	—	—

la dernière partie de l'itinéraire, les montagnes du »Schweizerland« ne réapparaîssent plus complètement; nous sommes déjà descendus trop bas. (Voir panorama au camp 27). — Sondage au camp 27. Au-dessus 35—45 cm de neige mouillée, granuleuse, plus bas couche glacée de 8—15 cm; ensuite névé et enfin à 76—96 cm glace solide.

19 Juillet. Remarques météorologiques. 1^h a. Au-dessous du

Ci-Str et Ci-CU très distinctement une couche inférieure = A-Cu margarodes. Le matin, la nébulosité augmente très rapidement, les montagnes éloignées disparaîssent bientôt dans un voile et leur mesure et leur identification se fait à peine. A 2^h p, la nébulosité est surtout dense S, SE et E; on y voit des trainées de précipitation et un ciel menaçant. Vers 4^{h}30 p quelques gouttes de pluie.

Itinéraire du camp 27 au camp 28. Voir jour suivant.

20 Juillet. Itinéraire du camp 27 au camp 28. (Fjordblick). Du 19, 10^{h}07 p au 20, 4^{h}45 a. Au départ, le temps s'éclaircit; la neige ne porte pas encore très bien nos chiens. La surface est lisse jusqu'au camp 28, et sans crevasses. A gauche, on continue à voir les montagnes au-delà du Sermilik. Nous nous étonnons de voir que le chemin ne s'abaisse pas sensiblement. Environ vers km 14, on observe dans la direction de notre chemin des montagnes au-dessus de l'horizon. Je suppose que ce sont les montagnes de l'île de Angmagsalik. Au km 16, je suis surpris et inquiété, par rapport à notre position supposée, de voir surgir des têtes rondes à droite de notre direction, en partie des rochers abrupts vers la gauche et avec des névés, en partie, ce sont des collines arrondies, couvertes de névé. Plus tard, plus au loin, un sommet pointu, probablement le cap Tycho Brahe. C'est seulement à partir du km 17, et surtout de km 23 que nous descendons assez fort. Il s'ouvre un point de vue sur le Fjord; la topographie nous reste encore incompréhensible. A gauche du cap Tycho Brahe, au sud-est, on distingue à l'horizon éloigné un trait sombre; c'était l'eau de l'océan Atlantique. Une raie gris-blanche, près de la côte, indiquait la zone de la glace flottante; évidemment elle n'est pas forte cette année. Tout le terrain qui entoure le fjord, paraît enneigé jusque vers 300 m au-dessus de la mer. Dans les creux, la neige semble s'étendre jusqu'au fjord même. — Voir la topographie du camp 28 dans le texte de la planche IV. Sondage au camp 28: 25—45 cm de neige granuleuse; ensuite couche de glace 18—22 cm; ensuite environ 35 cm de neige granuleuse solide. Enfin, à une profondeur totale de 75—80 cm glace solide. Densité de la neige à 50 cm: 0,595.

21 Juillet. Remarques météorologiques. Les nécessités immédiates d'orientation à l'arrivée dérangent un peu quelques observations.

Itinéraire du camp 28 au camp 29. Du 20, 9^{h}30 p au 21, 2^h a. La neige est encore assez lisse et assez bien gelée. Couverture de neige jusqu'au camp 29, bord de l'inlandsis. Nous descendons en plusieurs vagues, avec direction E 32°S (dans la supposition que la massif arrondi qui surgit à droite de notre direction au loin, et qui encadre la baie des glaciers, est en réalité une presqu'île). Après 6 km, il faut tenir la direction E 10° N. (Il faut rester à un certain niveau pour éviter des systèmes de crevasses, qui, vers SE, s'avancent à la baie de glaciers

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22 Juillet	8.00 a	—	—	822	697,5	4,9	76	4,9	NNW	2,6	—	1	Ci-Str	—	Min. { air 1,1, neige 0,0; 4h p Actinom.: 64
23 Juillet	8.00 a	29b	639,0	780	695,0	5,4	56	3,8	N	5,4	—	0		—	Min. { air 2,3, neige 0,0
	2.00 p	29b	—	780	696,8	5,9	58	4,1	»	7,5	—	0		—	—
	9.00	29b	—	780	698,2	5,3	57	3,8	—	—	—	3	Ci	—	—
28 Juillet	9.00 p	30	645,0	153	752,3	10,9	—	—	C	0	—	0	—	—	—
30 Juillet	9.00 p	D	—	36	760,0	7,3	79	6,1	SW	1,4	—	0	Ci	—	—
31 Juillet	8.00 a	D	—	36	760,2	4,1	—	—	C	0	—	0	—	—	—
	2.30 p	»	—	36	760,1	8,1	68	—	SSW	2,4	—	—	—	—	—

appelée plus tard Petersenbucht). A la fin, nous nous dirigeons de nouveau, dans une descente modérée, sur une sorte de dos vers le SE, vers un rocher très noir et vers une moraine haute de 20—30 m, formée de grands blocs de gneiss.

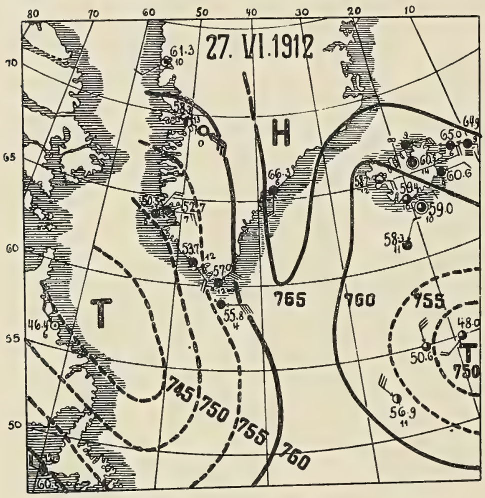
22 Juillet. Le camp 29 qui se trouve au bord de l'inlandsis au-dessus de la moraine, est échangé contre une place qui est de 30—40 m plus bas et éloignée environ de 200 m (camp 29b); on y est mieux protégé contre le vent. — L'actinomètre est emporté et perdu par un chien.

23 Juillet. Le soir, Q. et G. observent au fjord »Hundebucht« an niveau de la mer une tempête de föhn violente avec température de 16°. Les observations au camp 29b ne sont plus reproduites ici.

28 Juillet. Itinéraire du camp 29 b au camp 30. Départ 12h30 par le camp 29, d'abord plus haut que moraine frontale, avec direction ENE, suivant la descente lente; ensuite traversant la moraine vers ESE par des pentes enneigées étendues, interrompues quelquefois de rochers arrondis avec moraine. Ces pentes forment le flanc droit d'une vallée vague qui descend vers le sud-est et que nous suivons. Quelques gradins de rocher nous obligent de porter les traineaux par moments. Vers 7h, arêt à 400 m au haut d'un amas énorme de neige, qui descend environ

300 m vers la fin du fjord vers SSW. Nous descendons cette pente énorme de neige, amassée par le vent; elle laisse jaillir en bas un ruisseau très fort. Le camp 30 se trouve au pied de cette pente à 153 m au-dessus de la mer.

29 Juillet. Itinéraire du camp 30 au bord du Fjord (Hundebucht). Environ 1—2 heures à travers des champs de blocs peu inclinés vers le SSE. Sur la gauche d'un cours d'eau, qui est nourri par la grande pente de neige, et surtout par une grande chute d'eau qui se trouve au fond de la vallée.



Föhn »total« du SE.

29—30 Juillet. Voyage en kajak du fond du fjord (Hundebucht) jusqu'au dépôt au Grand Sermilik.

31 Juillet. 2^h p. Arrivée de trois eskimos en kajak au dépôt.

1 Août. De Quervain, avec deux eskimos, va en kajak à Angmagsalik.

C. Relation du temps observé durant la traversée avec les situations synoptiques.

Nous donnons un résumé très concis de ces situations dont la connaissance est indispensable pour expliquer les phénomènes météorologiques dans la traversée. Certains jours très intéressants sont traités avec un peu plus de détails.

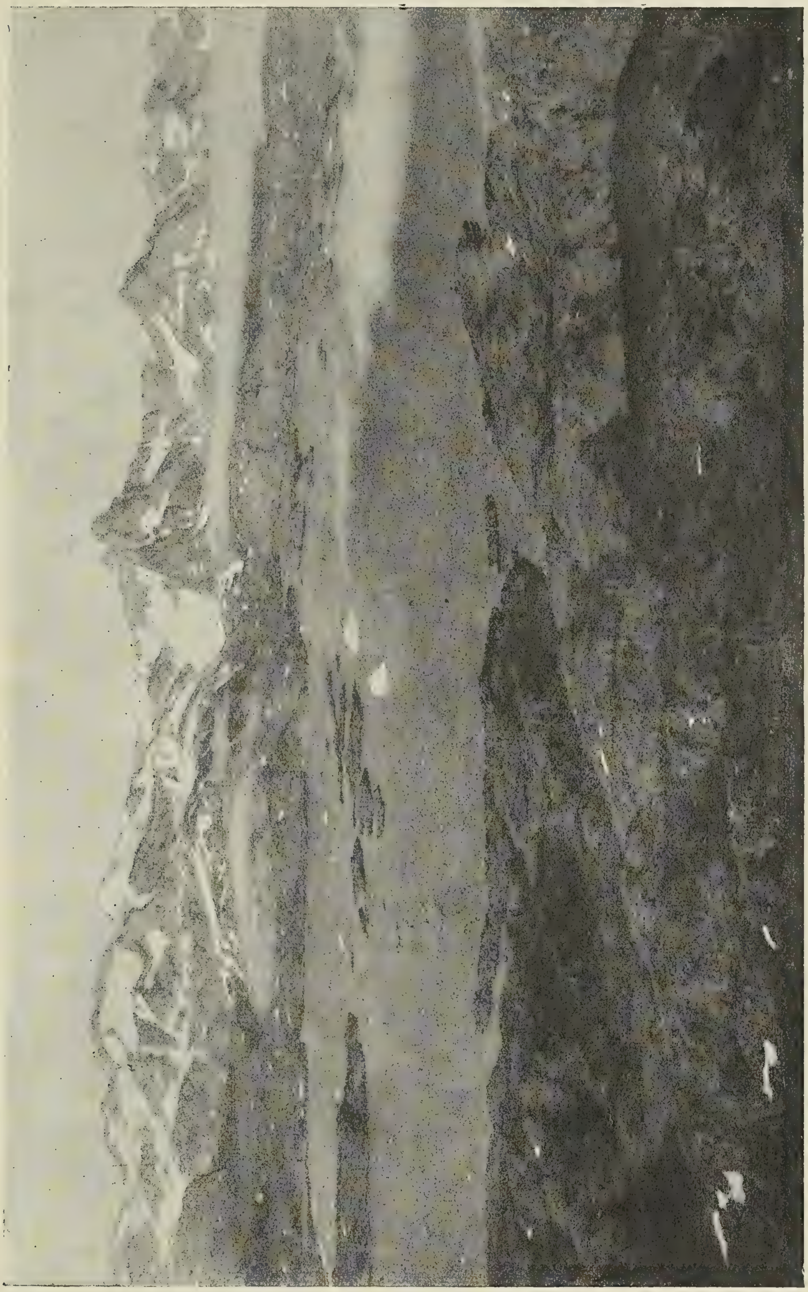
1. Situations synoptiques.

Le matin du départ du bord de l'inlandsis, 20 juin.

Le Grönland moyen se trouve au nord d'un minimum dont le centre est loin au S, au-dessus de l'Atlantique. Les gradients au-dessus du Grönland sont très petits.

Jusqu'au matin du 31 juin, la pression du Grönland a un peu augmenté; on admet un anticyclone faible. A cette augmentation du gradient vers l'ouest correspondent l'éclaircissement et l'augmentation du vent (SE) du 20 au 21 sur l'inlandsis et à son bord.

Le 21 juin la pression diminue lentement à la côte de l'ouest jusqu'au 22 juin. En même temps, elle monte à la côte E; de là le maximum du vent le 22 monte.



Le 23 juin il se trouve sur le Grönland un coin de haute pression qui se trouve entre 2 maxima au-dessus du Labrador et à l'ouest de l'Europe.

Le 24 juin situation peu changée.

Le 25 juin encore peu de changement. C'est un jour typique d'été, autant qu'il est possible au Grönland.

Le 26 juin il existe encore un gradient faible sur le sud, avec un maximum peu important au-dessus de l'intérieur.

Le 27 juin, la carte ci-jointe donne la situation. Fort gradient vers E ou ESE, un föhn traverse tout le Grönland.

Le 28 le minimum est revenu vers W, la situation ressemble à celle de la veille, mais les gradients sont plus petits.

Le 1 juillet le minimum est monté depuis Terre-Neuve vers le détroit de Davis, jusqu'à 64° N. Ici un cas de föhn total. Voir la tempête sur l'inlandsis et la carte ci-jointe.

Le 2 juillet le minimum s'éloigne vers le N ou NW; à l'intérieur un changement du vent est très retardé, seulement de 11^h à midi, le changement de la direction à SE et ESE indique que le minimum s'éloigne vers le NE.

Le 3 juillet tout le Grönland moyen et méridional se trouve dans la région d'une dépression peu intense. Un minimum se trouve peut-être au SE d'Angmagsalik.

Le 4 juillet un maximum relatif se trouve à la côte W moyenne et probablement encore plus exprimé, à l'intérieur au nord de la traversée. Faible gradient NS. A ce faible gradient correspond le calme sur l'inlandsis, et le froid de rayonnement.

Le 5 juillet basse pression peu importante sur tout le Grönland, sans gradient marqué, ni changement de pression.

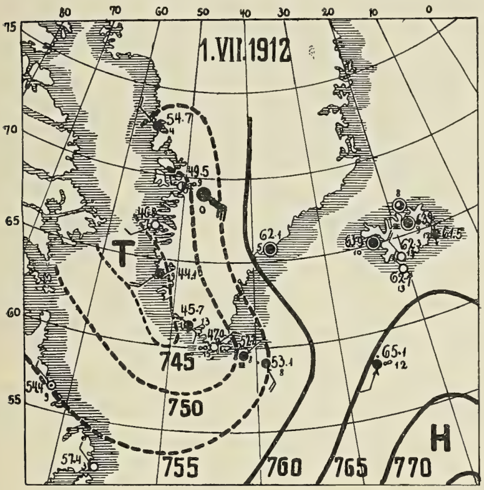
Le 6 juillet même uniformité de la pression, mais qui diminue pendant le jour.

Le 7 juillet voir la carte ci-jointe; minimum important devant la côte du Grönland moyen, provenant sans doute directement du nord de la Hudsonsbai. La pression reste constante de 8 à 12^h et remonte ensuite rapidement. A ces deux termes, Jakobshavn a un vent de W 2 et WNW 2 et seulement au soir SSE 3. L'escouade de l'W par contre a SE 8 et 9 pendant tout le jour, même aux nuages supérieurs. Sur l'inlandsis tempête de SE; déjà presque partie appartenant à la côte E d'un föhn total, depuis la nuit et pendant tout le jour.

Le 8 juillet la dépression ou un minimum secondaire paraît se transporter sur l'inlandsis au S de la traversée; à la côte W la pression est remontée avec vent du nord. A cette situation correspond la direction constante du vent de SE sur l'inlandsis, aussi bien à la descente qu'à la montée de la pression. Le fait que le 7 juillet le temps était tout à fait couvert s'explique peut-être par l'hypothèse que ce jour là, le versant E a pris part à la circulation du minimum ce jour là.

Le 9 juillet la circulation du Grönland moyen et méridional paraît dépendre de la partie arrière d'un minimum important, qui se développe

au SW de l'Islande. On peut admettre sur le Grönland du nord un maximum peu important, qui s'étend vers le sud, en formant un coin, et qui permettrait d'expliquer le vent du SE sur l'inlandsis.



Tempête du SE, sur l'inlandsis.

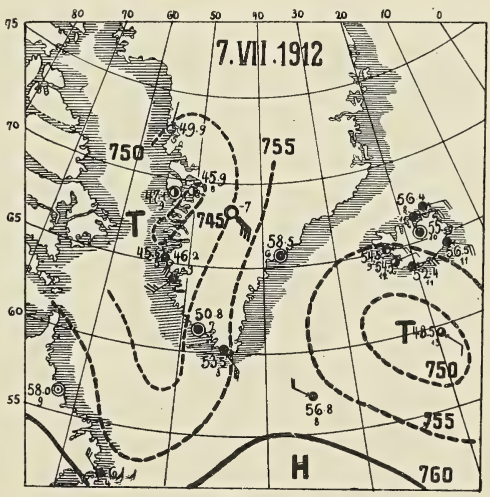
Le 10 juillet la répartition de la pression n'a pas changé sensiblement. Le vent WNW sur l'inlandsis s'explique par la dépression qui se trouve encore à l'est.

Le 11 juillet ce dernier minimum s'est creusé et se trouve audessus de l'Islande. Le Grönland se trouve sous l'influence de cette partie arrière, ainsi il faut comprendre le vent sur l'inlandsis, tournant de NE à N WNW.

Le 12 juillet le minimum d'Islande se comble sur place. Une autre dépression venant du Labrador se trouve sur le Grönland méridional, alors que sur la côte est, la pression monte encore. C'est ainsi que s'explique la tempête SE du matin du 12.

Le 13 juillet le centre de dépression se trouve à 500 km à l'est du cap »Farvel«, malgré cela, encore faible vent de ESE sur l'inlandsis, le matin. Le vent du NW revient seulement le soir.

Le 14 juillet (voir la carte): le centre de la dépression s'est transporté vers le SW de l'Island, tout le Grönland est sous l'influence de sa partie en arrière. Le vent de WNW jusqu'à NW correspond donc à cette situation synoptique. L'éclaircissement du temps peut avoir un léger caractère de föhn.



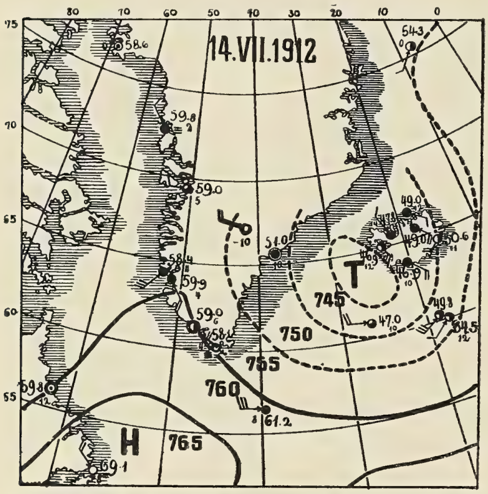
Tempête du SE, sur l'inlandsis.

Le 15 juillet (voir la carte): un minimum important s'est rapproché de la côte du Grönland, amenant des vents violents de S et SE, sur la côte (Jakobshavn) et l'escouade de l'ouest font en même temps, que

la pression monte en arrière de la dépression d'Islande, qui se trouve aujourd'hui entre l'Islande et Spitsberg. Sur l'inlandsis nous sommes encore sous cette dernière influence, avec vent du NW modéré, lors que la côte ouest a le föhn du SE. Ceci est donc un cas très intéressant, où il y a un gradient et où il y a un vent de föhn directement opposé sur les deux versants de l'inlandsis.

Le 16 juillet, la dépression s'est transportée sur le »Spitsberg«. A la côte ouest, où un minimum secondaire paraît avoir passé le 15, le matin du 16 un nouveau minimum secondaire parait aller vers le nord, qui touche beaucoup le Groupe ouest, d'abord avec un vent fort de SE et le soir avec des averses violentes de pluie. Le Groupe de la traversée n'est pas touché par tout cela.

Le 17 juillet le minimum de la côte de l'ouest s'est éloigné vers le nord. Un minimum pas important semble se trouver entre la côte E et le maximum, qui se trouve au sud de l'Islande, à partir de la veille. Le vent du NW sur l'inlandsis paraît en dépendre.



Föhn du NW sur le versant E de l'inlandsis.

Le 18 juillet le maximum se trouve sur le nord de l'inlandsis. Depuis le Grönland moyen ouest (Jakobshavn 765) petit gradient vers le SE (Angmagsalik 761), le vent du NW de l'inlandsis y correspond.

Le 19 juillet, pressions moyennes, uniformes. Sur l'Islande et au sud, pression un peu plus élevée. Le vent faible de WNW de la traversée correspond à un faible anticyclone de l'inlandsis.

Le 20 juillet, haute pression modérée sur tout le Grönland. Petit minimum entre l'Islande et la côte E.

Le 21 juillet, la dépression de la côte W s'est éloignée vers le nord.

Le 23 juillet, très haute pression sur la région nord et moyenne de la côte W. Par contre il faut supposer une dépression au-dessus de la côte E et NE, descendant jusque vers Angmagsalik. Dans le fjord de la côte E, nous avons observé ce jour là, au nord une tempête de föhn violente, avec direction N.

D. Conclusions principales sur le temps observé pendant la traversée.

On jugerait mal la signification générale de nos observations météorologiques, si on ne rendaît pas compte de la situation synoptique corres-

pondante. Nous allons résumer quelques points sur lesquels il faut attirer l'attention.

a) Les relations entre les vents observés sur l'inlandsis et la topographie et la situation synoptique.

Après les expériences immédiates de notre traversée et sans connaître la répartition de la pression, nous avions l'impression d'une relation très typique, très régulière entre le système des vents de l'inlandsis et sa topographie: sur le versant de l'ouest des vents du sud-est très réguliers, forts et quelquefois soufflant en tempête; par contre, sur le versant de l'est des vents du nord-ouest également très marqués mais moins forts. Nous pourrons dire, que l'air s'écoule de l'intérieur du Grönland comme un fluide, le long des pentes, vers les côtes, mais dévié à droite de 45°, par suite de la rotation de la terre.

Cette constatation faite semble donner un appui important à l'hypothèse de l'existence — même en été — d'anticyclones intenses sur un inlandsis, suivant les idées de W. Hobbs.

Mais dès qu'on arrive à comparer les situations synoptiques, les conclusions de vont être modifiées. Un hasard systématique a voulu que, pendant la première moitié de la traversée les minima importants se trouvassent surtout au SW, commandant le temps de tout le Grönland méridional et moyen et partiellement jusqu'à la côte est. Nécessairement la direction du SE devait prévaloir sur l'inlandsis pendant cette époque et l'intensité de ces vents dépendait surtout des gradients cycloniques.

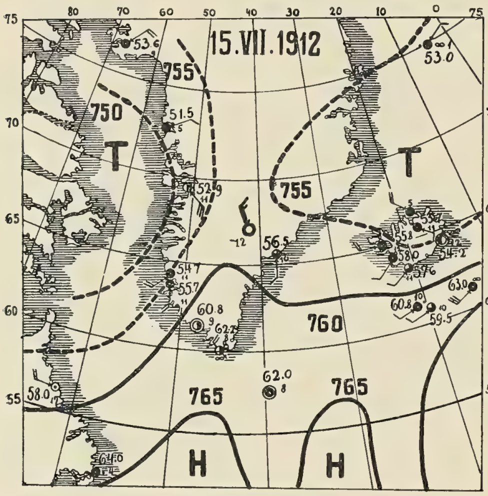
Dans la seconde moitié de la traversée, où les observations étaient faites sur le versant est, des dépressions se trouvaient fréquemment au SE du Grönland et commandaient le temps du Grönland méridional et moyen et quelquefois jusqu'à la côte ouest. Par conséquent, les vents du NW, qui caractérisent la seconde moitié de la traversée, sont donc déterminés, dans les cas les plus marqués, par la position d'un cyclone (voir les cartes du 14 et 15 juillet). En ce cas le faîte de l'inlandsis ne détermine pas nécessairement une limite des vents.

Si nous avions exécuté la traversée dans le sens inverse, mais à la même époque, l'impression de cette régularité, constatée au début, n'aurait plus existé. Toutefois, la constatation de l'influence de l'inlandsis en elle même, agissant dans ce sens, reste acquise.

b) Les cas de »föhn total«.

Ce sont les situations où la répartition de la pression et le vent sur tout l'inlandsis sont déterminés par une dépression qui se trouve sur l'une des côtes. La situation totale peut alors être considérée comme un cas de föhn dans lequel l'un des versants de l'inlandsis possède un

temps relativement clair, avec composante descendante du vent, alors que l'autre versant a les vents ascendants avec condensation. Pendant les 30 jours de la traversée, nous avons eu des cas semblables le 27 juin et le 1 au 2 juillet, (voir les petites cartes ajoutées plus haut). On a même pu constater des cas, où l'influence a dépassé l'altitude maxima de l'inlandsis, ainsi le 10 juin. Qu'on compare aussi les cas de vent le NW, trouvés avec les ballons pilotes à la côte ouest, en automne et au printemps.



Föhn »double«.

c) Cas de föhn double.

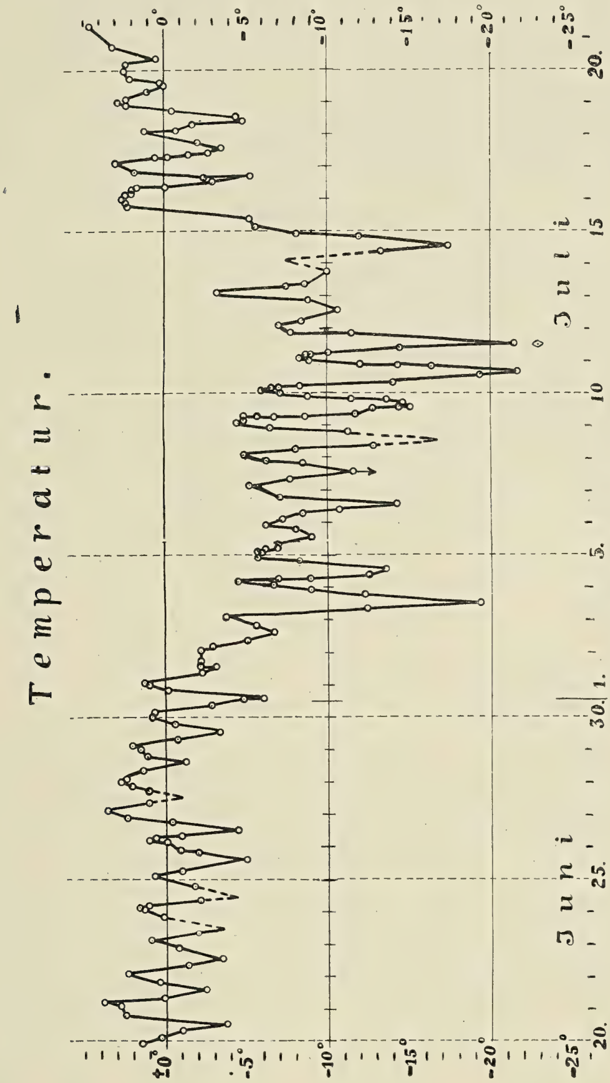
Les cas où le vent vient du sud-est à la côte ouest et du NW à la côte est peuvent être considérés comme caractéristiques, avec l'idée que c'était l'effet d'un anticyclone sur l'inlandsis. Des cas pareils ont été trouvés le 15, 16 et 19 juillet (voir la carte pour le 15 juillet) mais dans leur formation des dépressions situées sur l'une ou l'autre côte ont pris part. Ca n'empèche pas de parler en même temps d'un anticyclone glacial mais dont le centre devait se trouver plus vers le nord de l'inlandsis.

d) Direction septentrionale des trajectoires des dépressions à la côte de l'ouest et traversée de l'inlandsis par les dépressions.

Bien que l'anticyclone de l'inlandsis ne soit pas très marqué à cette saison et à la latitude du Grönland moyen, le continent du Grönland joue pourtant le rôle d'une barrière séparatrice pour la grande circulation, même à cette saison. Cela s'exprime dans la direction prise par les minima qui viennent de la Baie d'Hudsons. Parmi tout les minima qui ont fait apparition pendant notre traversée aucun n'a traversé l'inlandsis à notre latitude, ou au nord, dans la direction W—E. Cependant cela paraît avoir été le cas plus au sud, à la latitude de la traversée de Nansen; ainsi le 3, le 8 et le 12 juillet, où il s'agissait de dépressions secondaires.

Mohn lui-même relate un cas semblable, pour la traversée de Nansen. Dans notre traversée ces cas se trahissaient seulement par un virage transitoire du vent SE vers E et NE.

Pour d'autres minima, tout fait supposer qu'ils sont remontés le détroit de Davis vers le nord. Les observations d'un navire danois, qui était en route pour le »cap York« ont fourni des preuves précieuses. Dans



Température durant la traversée.

1912

ces cas (22 juin, 1 et 2 juillet, 15, 16 juillet) le vent du sud-est joue le rôle que prend en Europe centrale et particulièrement au nord des Alpes, le vent du SW, et le föhn, tandis que le vent du SW observé à la côte du Grönland, correspond à la partie arrière d'une dépression qui marche vers le nord. Le vent du N ou NW de la côte orientale est ou bien un courant très peu élevé, apportant le brouillard de la mer vers la côte, et au-dessus duquel le vent du SE continue en général,

ou bien alors, ce courant du nord-ouest est déterminé par un minimum très profond, qui se trouve entre la côte de l'est et l'Islande. — Sur l'inlandsis le passage d'une dépression allant vers le nord ne se fait guère sentir directement. Une seule fois, on a observé un virage du vent du SE à E et au SW; la continuation de ce virage vers W et NW, qui aurait trahi une dépression passant à travers l'inlandsis au nord, n'a pas été remarquée.

E. La caractéristique des éléments météorologiques pendant la traversée de l'inlandsis.

1. La température.

a) La décroissance de la température vers l'intérieur.

On pourrait attendre a priori que les températures rencontrées sur l'inlandsis se présentent comme l'image inverse d'un profil d'altitude assez régulier. Ceci n'est pas le cas. Un regard jeté sur le diagramme qui va suivre prouvera que la température fait un saut très marqué à deux limites qui séparent une région centrale de 2 régions bordières. Pendant les premiers 13 jours de la traversée qui correspondaient à une montée de 550 jusqu'à 1900 m la température moyenne était de — 0,85° et une descente progressive se distinguait à peine. Le 13 juillet, à la hauteur de 1936 m, nous fûmes subitement dans une région de froid, qui s'étendit pendant 13 jours, jusqu'à la hauteur maxima et plus loin, jusqu'à la hauteur 2250 m à la descente. Dans cette région des froids, les température moyennes sont de —10,0° et ne s'en éloignent que de $\pm 1{,}6°$ en moyenne; le minimum des moyennes journalières est de —14°,1. Subitement, pendant les derniers 5 jours de la traversée, la température remonte. Sa moyenne, pendant ces jours, est de 0,0°.

La région centrale du froid avait un diamètre de 280 km, sa distance du bord de l'ouest et de l'est de l'inlandsis est de 180 et de 170 km. On peut considérer l'existence de cette région centrale du froid comme un phénomène typique; c'est la région qui est moins troublée par les tourbillons atmosphériques des côtes, et où les masses d'air arrivent plus facilement à une stagnation et un rayonnement nocturne intense, pour se répandre en suite, en forme de vent régulier, vers les deux côtes, cependant pas avec la régularité qu'on admettrait sans connaître les situations synoptiques.

b) Les marches diurnes sur l'inlandsis.

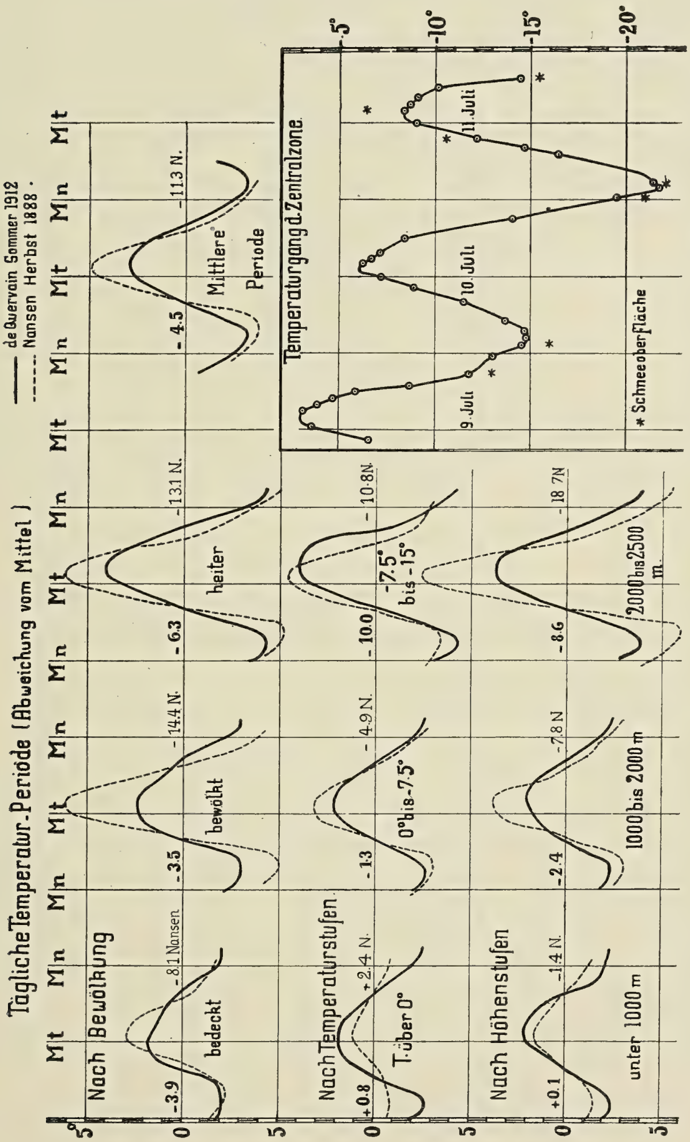
C'est une des données les plus intéressantes qu'on puisse déduire de nos observations, ceci déjà en vue d'une comparaison avec les observations de Nansen. Le matériel a suffi pour déduire la marche pendant le temps où nous étions en général réveillés; pour la nuit, ce sont les thermomètres à minima qui peuvent combler la lacune. L'heure du maximum des jours normaux est en moyenne $2^h{,}10$ p. l'heure du mini-

mum nocturne a était constatée 2 fois; elle peut être $2^1/_2$ à 3^h. On a ainsi construit un diagramme, dont on a déduit pour tous les jours des indications trihoraires.

c) Marche de la température dans la zône bordière.

Jour caractéristique, 23 au 24 juin.

Le minimum a été trouvé après $1{,}30^h$ de la nuit, le maximum entre 2 et 3^h p. L'amplitude est de 6°,6; la température maxima monte à 1°,6, cela prouve qu'elle était déterminée par d'autres facteurs encore



Température: variation journalière, durant la traversée. (Dans le carton: région centrale).

que l'échauffement de la surface; il peut y avoir absorption et échauffement adiabatique. La force du vent est en moyenne 4 à 5 m de 9^h a jusqu'à 9^h p, elle tombe de 6,6 m à 1 m. Ce vent peut-être considéré comme normal. Des journées calmes qui seraient intéressantes au point de vue de la marche diurne, n'ont pas été rencontrées.

d) Marche de la température dans la zône centrale.

(Comparer les figures pour le 9, 10 et 11 juillet).

Pendant ces jours l'altitude est de 1000 à 2000 m. Le premier jour forme un exemple, pour le cas où le vent continue même pendant la nuit, (maximum du vent à 2^h p: 7 m, le minimum 9^h p: 3 m, maximum de température à $2{,}30^h$ p, minimum vers 3^h a) amplitude 10°,9. Le second jour du 10 au 11 juillet, le vent tombait pendant la journée à zéro — une grande exception. Pendant la nuit la vitesse du vent est encore de 1 à 2 m; le maximum de température du 10 juillet est observé vers 2^h de l'après midi, le minimum du 11 juillet vers $2{,}30^h$ a. L'amplitude du 10 au 11 est de 15°,5, les moyennes successives de ces 3 jours sont de —10°,0, —11°, et —14°,0. Nous n'avons pas constaté un jour avec calme absolu, au moins pendant la nuit, dans ce cas l'amplitude indiquerait probablement 20° et le minimum serait sans doute de quelques degrés plus bas que nous ne l'avons observé (air — 21°,6, neige — 23°,0). On peut admettre comme probables des températures extrêmes d'au moins — 25°, pour cette hauteur, cette région, et cette saison. Nous rappelons que pendant notre traversée, on n'a jamais vu un ciel absolument pur. Ce fait a dû diminuer les amplitudes et aussi les minima.

e) La marche diurne de la température au point de vue de la nébulosité, de la température et de l'altitude au-dessus de la mer.

On a employé la même méthode de réduction et les même critères que Mohn, qui a dépouillé les observations de Nansen.

Relation avec la nébulosité. Plus la nébulosité décroît, plus l'amplitude augmente. Pour un ciel couvert elle est de 3°,7. Ce nombre indique que les nuages ne sont pas assez denses pour exclure le rayonnement. L'amplitude moyenne de la zone centrale est à peu près égale aux amplitudes moyennes d'avril, de mai et aussi de septembre pour la plaine suisse. Ce même chiffre se trouve à Zürich les jours clairs d'hiver. Sur l'inlandsis l'amplitude diurne des jours couverts est un peu plus grande que l'amplitude moyenne en été sur le sommet du »Säntis«, (2500 m) avec 3°,0. Dans les diagrammes qui se rapportent aux températures et aux altitudes on est frappé avant tout par la concordance des amplitudes dans les 2 premières divisions (température

au-dessus de 0, température de 0 à — 7°,5, et altitude au-dessous de 1000 m et de 1000 à 2000 m). Il y a un saut très marqué au 3. groupe (température de — 7°, — 5° à —15°, hauteur de 2000 à 2500 m. Le fait qui s'exprime ici est la séparation frappante déjà mentionnée des 2 zones bordières et d'une zone centrale. Pour la comparaison de nos données avec celles de Mohn-Nansen, qui sont aussi portées dans nos diagrammes, il faut rappeler la différence de saison. Nos chiffres correspondent aux conditions d'été, ceux de Nansen plutôt aux conditions d'automne; c'est pourquoi ils ont des amplitudes plus considérables, sans doute les plus grandes qu'on puisse trouver sur l'inlandsis.

En effet, il faut s'attendre à une disparition des variations périodiques de la température en hiver, à 2 amplitudes maxima au printemps et en automne et à une amplitude modérée en été. C'est cette dernière que nous avons constaté. Notre amplitude moyenne diurne de juin, juillet, a la valeur 5°,9 alors que Mohn déduit des observations de Nansen, la valeur sensiblement plus forte de 8°,5. Déjà notre valeur dépasse celle déduite par Hann pour ces latitudes (4,0). L'excès démontre, malgré la couverture de glace, le caractère plus continental et la grande altitude de l'intérieur du Grönland.

Il est assez curieux d'avoir constaté ce maximum d'automne sur l'inlandsis, lequel est très insignifiant, ou même inexistant dans les endroits situés au voisinage de la mer.

C'est avec un intérêt tout particulier, qu'on verra plus tard s'insérer ici les données de la traversée de Koch et Wegener de 1913, pas encore publiées.

f) Le gradient thermique vertical.

Si nous parlons d'un gradient vertical, il ne faut pas oublier que dans notre cas, le rapport de la distance verticale à la distance horizontale n'a été que de 1 : 100, mais étant donné la régularité de la croissance d'altitude vers l'intérieur, il est toujours permis d'appliquer avec cette restriction la notion du gradient.

Pour les observations de température comme pour les autres mesures météorologiques, nous avions comme point de base la station de Jakobshavn et les observations du Groupe de l'ouest, pour la côte ouest; la station d'Angmagssalik, pour la côte de l'est. Les deux premiers points de base étaient sans doute plus favorables, parce que l'air pouvait s'écouler librement de leur côté, alors que la station d'Angmagsalik est entourée de montagnes qui dépassent 1000 m, et sa distance au bord de l'inlandsis est de 60 à 100 km. La comparaison ne peut donc s'appliquer à des cas déterminés; elle a plutôt un sens climatologique. Nous faisons suivre les valeurs des gradients moyens, pour les 3 heures d'observation régulière, ainsi que pour les minima. Les moyennes sont

formées de façon à tenir compte de l'importance des différences d'altitudes.

Gradient thermique vertical moyen juin, juillet.

		d'après minimum	8^h a	2^h p	9^h p	moyen
Base	Bord de l'inlandsis groupe ouest 530 m	0,85	0,79	0,60	0,79	0,76
	Jakobshavn, 13 m, côte ouest	0,76	0,69	0,62	0,71	0,70
	Angmagsalik, 31 m, côte est.......	0,65	0,75	0,70	0,63	0,68

Les gradients de la côte ouest montrent les valeurs élevées qui indiquent que même en été, la perte par rayonnement est prépondérante sur les hauts plateaux de l'intérieur; par conséquent, le gradient de midi est le plus petit, le gradient nocturne le plus fort.

Il sera plus instructif de citer quelques cas, où les conditions de rayonnement ont été marquées:

Gradients hyperadiabatiques avec rayonnement.

	d'après minimum	8^h a	2^h p	9^h p	moyen
4 juillet					
Groupe ouest, bord de l'inlandsis	1,57	1,24	1,00	1,20	1,25
Jakobshavn	1,21	0,96	0,71	0,88	0,93
12 juillet					
Groupe ouest, bord de l'inlandsis	1,09	0,76	0,53	0,69	0,77
Jakobshavn	0,96	0,59	0,61	0,55	0,68

Nous trouvons donc tôt dans le matin et en partie pendant toute la journée, des gradients dûs au rayonnement, qui au point de vue dynamique, sont instables et qui prouvent que les vents qui coulent de l'intérieur vers les côtes, doivent se former nécessairement. Le 12 juillet, il y a apparition de mauvais temps au courant de la journée, qui diminue le gradient vertical.

On constate le minimum des gradients, quand il y a mauvais temps, aussi bien à la côte qu'à l'intérieur, ainsi que fait comprendre l'exemple suivant:

Faibles gradients avec temps partout couvert.

	d'après minimum	8^h a	2^h p	9^h p	moyen
2 juillet					
Vers bord de l'inlandsis W...............	0,54	0,41	0,35	0,35	0,41
— Jakobshavn	0,39	0,38	0,45	0,42	0,41

g) Gradients thermiques avec phénomène de föhn.

La constatation du gradient réel pour quelques cas du föhn classique du Grönland paraît particulièrement intéressante, ceci d'autant plus que c'est la première fois qu'on peut donner ces observations. Nous choisissons 3 dates, auxquelles d'après les observations de Jakobshavn, on a eu à la côte un föhn typique, avec vent SE violent, avec une forte hausse de température et une humidité rélative faible.

Gradients avec föhn.

	d'ap. l. minimum	8^h a	2^h p	9^h p
27 juin				
Vers bord de l'inlandsis W.	1,02	1,24	{ 0,43 1,05	0,83
— Jakobshavn, diff. de haut. 1384 m	0,88	0,87	0,97	0,95
29 juin				
Vers bord de l'inlandsis W.	0,85	0,88	{ 0,60 1,04	0,77
— Jakobshavn, diff. de haut. 1605 m	0,57	0,95	1,04	0,89
1 juillet				
Vers bord de l'inlandsis W.	1,05	0,63	0,77	0,55
— Jakobshavn, diff. de haut. 1814 m	0,60	0,52	0,80	0,52

Dans les 2 premiers cas, où le föhn a été particulièrement fort à Jakobshavn, on a donc constaté un gradient vertical adiabatique, correspondant bien au föhn.

Il est très curieux de calculer, pour ces deux cas, l'humidité spécifique, pour notre cas sur l'inlandsis et pour Jakobshavn. On sait qu'en théorie cette valeur doit rester constante.

Humidité spécifique.

27 juin	3,4	Jakobshavn	3,8	Inlandsis	1400 m
29 —	3,55	—	3,8	—	1620 -

Nous trouvons en effect une concordance satisfaisante. Ayant mesuré à une station de base la température de l'air et la température du point de condensation, dans le courant descendant, il est possible de calculer la hauteur à laquelle ce courant devait être saturé. On peut pour cela se servir de la formule de Ferrel $h = 125\ (t - \tau)$. Pour les deux cas déjà cités on trouve les valeurs 2250 m et 2400 m. Pour un autre cas observé peu avant à Jakobshavn (25 mai 1912) on trouve 2350 m. Comme altitude maxima de notre traversée, nous avons trouvé directement 2500 m. Avec l'inclinaison mesurée par nous, on trouve pour la région d'où devaient provenir les filets d'écoulement aboutissant

à Jakobshavn, un hauteur de 2400 m environ: la concordance est donc en quelque sorte parfaite. Elle prouve que les masses d'air qui forment à Jakobshavn le phénomène du föhn sont descendues des plus grandes altitudes de l'inlandsis et l'ont même quelquefois traversé. Ce résultat peut se prononcer de la façon suivante: si vous vous intéressez à la hauteur maxima de l'inlandsis, vous pouvez parfaitement vous passer d'y aller voir; vous n'avez qu'à lire, par un beau jour de föhn, le thermomètre sec et le thermomètre mouillé de la station de Jakobshavn, et vous voilà renseigné et dispensé de votre traversée.

h) La température de la surface du névé.

Ce sont les mesures de minima nocturnes de la surface et un certains nombres d'observations faites pendant le jour, qui servent de point de départ.

On est frappé avant tout par la petite différence entre la température de l'air et celle de la surface. Dans les hauteurs correspondantes des Alpes, on trouve cette différence égale à 5 ou 6 degrés, alors que sur l'inlandsis elle était égale à 1° en moyenne et ne dépaissait pas 2°. On trouve l'explication dans le fait que les nuits n'étaient jamais calmes.

Si l'on compare la marche diurne de la température de l'air avec celle de la surface, on trouve que l'air suit de très près la neige. Vers 4^h a, la température de la surface atteint celle de l'air; jusque vers midi, la neige devient plus chaude de 2° à 3° et même 4° dans un cas isolé. Vers 3 ou 4^h, la température de la surface descend déjà au-dessous de celle de l'air; vers 6^h elle est déjà plus froide de 1° et cette différence n'augmente plus jusqu'à l'heure du minimum, qui arrive 1 ou 2^h de la nuit.

i) Variations de température apériodiques.

La première variation de ce genre a eu lieu, le 27 juin, par vent de föhn; la température remonte brusquement de 4 degrés. La deuxième et troisième variation correspond à l'entrée et à la sortie de la zone centrale de froid, aux dates du 3 et du 15 juillet.

2. Le vent.

Nous allons discuter séparément la vitesse et la direction.

a) La vitesse du vent.

Le fait saillant est le mouvement très intense et presque ininterrompu. Parmi 200 observations on a noté le calme seulement 6 fois. La vitesse moyenne a été 5,2 m par seconde, la vitesse maxima mesurée 17 m, le 1 juillet à 1800 m. Ce jour là, le maximum estimé atteignait environ 20 m. L'avance sur les skis était impossible même en s'appuyant

sur les 2 bâtons. Dans la région boréale on compte comme journées de tempête celles qui dépassent 10 m par sec. En ce cas, nous avons eu 5 de ces jours.

La marche diurne de la vitesse du vent.

S'il est possible de déduire une marche diurne, c'est grâce à 2 conditions favorables. D'abord nos nombreuses mesures du vent ont été faites toutes avec un anémomètre; ensuite, c'est la régularité absolument étonnante de la vitesse du vent sur l'inlandsis. Cette dernière se caractérisait par la constatation suivante: si l'on mesure la vitesse moyenne du vent pendant une heure et en plus, à un moment quelconque pendant cet intervalle, la vitesse instantanée pendant $^1/_2$ minute, on trouve le plus souvent un résultat concordant à quelques dixièmes de mètres. Une régularité pareille serait exclue dans les conditions ordinaires d'un continent; et même sur l'océan l'influence des vagues aurait un effet troublant.

Déjà l'impression immédiate nous faisait soupçonner une période diurne assez marquée. La réduction de nos observations (voir le cliché et le tableau) la fait res sortir de la façon la plus évidente, le maximum arrive vers 8^h du matin, le minimum vers 7^h du soir, ceci pour le versant ouest; pour le versant est les heures correspondantes sont 7^h a et 4^h p. Pour la côte occidentale l'analyse harmonique donne

$$W = 4{,}52 + 1{,}13\,(\sin 341^\circ + x)$$

qu'on trouve représentée dans le graphique.

Comment expliquer cette période diurne? Si le refroidissement de l'intérieur du continent est la cause principale des vents réguliers qui coulent vers la côte, on comprendra qu'à la périodicité de ce refroidissement doit correspondre une périodicité d'écoulement. Le retard de cette écoulement est analogue à celui d'un torrent glaciaire, dont le maximum n'arrive pas au moment de la plus forte ablation, mais quelque fois assez tard dans le soir.

Dans cet ordre d'idées, on est tenté de discuter les relations thermiques, singulières de la zone rocheuse de la côte, avec les régions voisines, celle de l'inlandsis et celle de la mer: il s'ensuit une circulation locale extraordinaire. Il y a en quelque sorte 2 genres de mers, qui bordent la zone rocheuse. A l'ouest, c'est la surface d'eau, avec sa basse température et sa petite variation, diminuée encore par l'influence du brouillard. Vient ensuite la zone des rochers élevés, qui offre un échauffement diurne et des variations considérables. Plus à l'est, il y a la mer de glace, l'inlandsis, avec ses températures basses et dont les amplitudes augmentent de plus en plus vers l'intérieur. Quelques observations que j'ai faites en passant des rochers à l'inlandsis, caractérisent très bien les grandes différences de température.

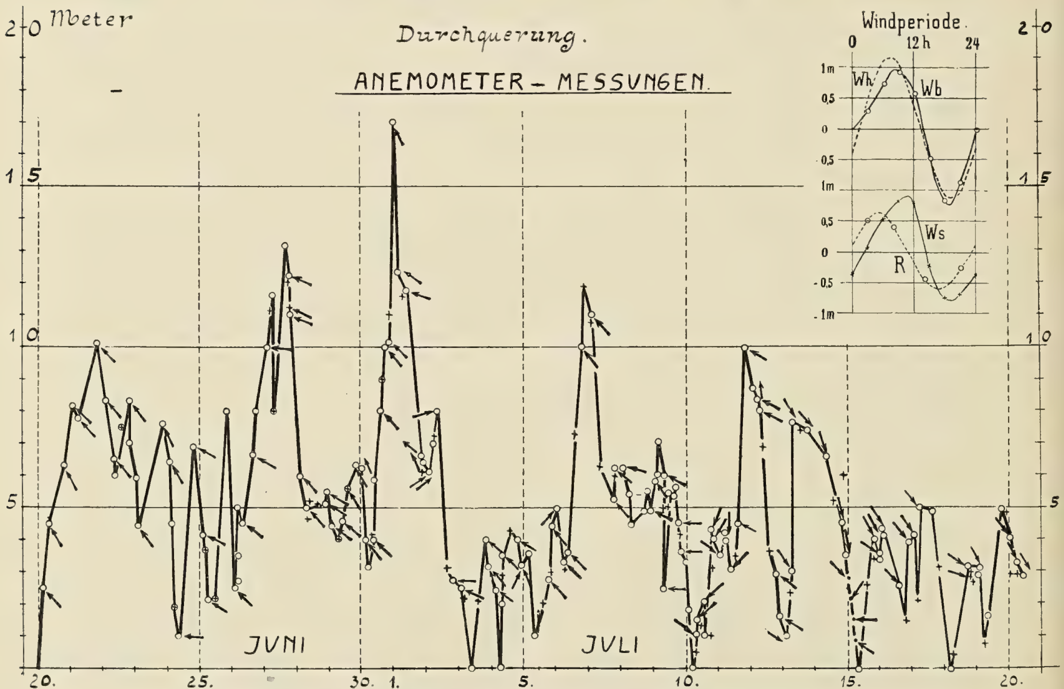
Comparaisons de températures au bord des rochers et au bord de l'inlandsis.
14. Juin.

	Mi-nuit	1h a	2h a	3h a	4h a	6h a	7h a	8h a	8h05a	9h a
	Degrés									
Bord des rochers, depôt II, 385 m ...	9,0	8,6	9,1	9,9	10,9	14,0	(15,0)	16,1	(16,1)	15,5
— de l'inlandsis..................	4,0	2,0	2,2	2,8	3,2	3,5	4,2	5,8	6,8	8,5
Hauteur au-dessus de la mer, mètres	580	690	740	800	845	790	690	610	550	550
Gradients de température	2,90	2,10	1,90	1,70	1,60	2,60	3,50	4,50	5,50	4,10

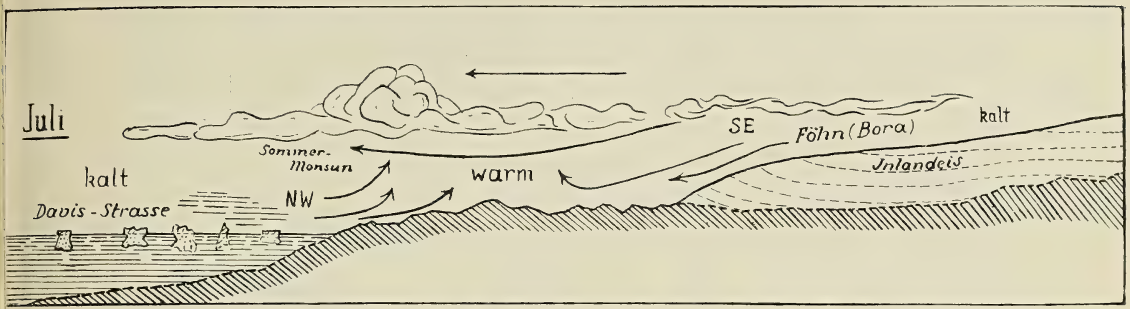
Nous trouvons donc le matin des gradients thermiques tellement forts, qu'il y avait des conditions instables, non seulement au point de vue dynamique, mais aussi au point de vue statique. Il se forme donc dans les rochers une sorte de »Bora« augmentant de $2^1/_2$ à 5 m, de 1^h de la nuit à 8^h du matin et qui ne tombe qu'à $1^1/_2{}^h$ vers le soir. Le lendemain elle était de nouveau montée à 9 m. Cette circulation n'atteint pas Jakobshavn, en général.

Comparaison des vitesses du vent mesurées sur l'inlandsis avec celles mesurées aux bords.

Pour l'époque entre notre départ du bord jusqu'à la plus grande hauteur de l'inlandsis, le groupe de l'ouest, qui est resté au bord de



Direction et intensité du vent durant la traversée.



Schèma de le circulation de l'air entre la mer et l'inlandsis, en été.

l'inlandsis et le groupe de la traversée, ont la même moyenne de la vitesse du vent. L'accroissement de la vitesse que l'augmentation de hauteur faisait attendre, est donc compensé par la situation plus à l'intérieur et plus éloignée de la circulation générale. La période diurne du vent se retrouve aussi dans les observations du groupe de l'ouest, mais non distinctement, les lectures ayant été un peu moins serrées. Le maximum de la vitesse se produit vers 5^h du matin (+ 0,6 m), le minimum à 5^h du soir (— 0,6 m). Pour expliquer cette périodicité, particulièrement au bord de l'inlandsis, il faudra aussi faire intervenir la théorie des brises de la montagne.

Vitesse du vent et gradient horizontal de pression sur l'inlandsis.

Si nous admettons un courant stationnaire et rectiligne, nous pouvons indiquer avec J. de Hann une relation entre le gradient de pression et la vitesse. Pour la latitude 68°, la pression de 666 mm, la température —5° et la vitesse moyenne de 4,5 m on trouve un gradient de 0,56 mm. Ce serait le gradient de l'anticyclone d'été sur l'inlandsis. Cependant cette valeur doit être un maximum, parce que l'écoulement de l'air sur la pente de l'inlandsis prend une vitesse propre qui n'est pas comprise dans cette formule.

b) La direction du vent.

La direction du vent a eu une très grande constance pendant les heures et même les jours. Cette constance extraordinaire a pu être employée pour maintenir exactement notre direction entre les lectures de la boussole.

Si on compare les directions du vent observées pendant toute la traversée, on trouve comme résultat frappant la diversité des conditions du versant de l'ouest et de l'est: le vent du sud-est prédominant sur le premier, le vent du nord-ouest sur le dernier. Le petit tableau suivant fait voir ces conditions.

	N	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Cas
Côté ouest de l'inlandsis	1,9	2,9	2,9	11,4	21,0	**31,5**	7,7	8,6	1,9	1,9	1,0	—	1,0	1,0	—	105
Bord ouest............	2,7	2,7	1,4	10,8	2,7	**51,3**	6,8	12,2	1,4	4,1	—	1,4	1,4	1,4	—	74
Côté est de l'inlandsis..	5,3	—	—	—	5,3	2,6	2,6	2,6	—	2,6	—	—	18,5	**34,1**	15,8	38

Il sera intéressant d'étudier la relation de ces directions avec celles de l'inclinaison de la surface. Les nombreuses mesures de cette dernière le permettent.

Pour le versant de l'est, nous trouvons une concordance très approchée entre la direction de la pente et celle du vent. Le vent suit la pente maxima, qui allait de NW au SE. Le résultat est autre pour le versant de l'ouest. Ici la pente maxima allait en moyenne vers E10°N, alors que le vent soufflait en moyenne de S 45°E; c'est à dire, déviait vers la droite de 55°. On peut y voir l'influence déviante de la rotation terrestre, mais aussi l'influence de la position prépondérante des minima sur le détroit de Davis. Mais dans la plupart des cas, cette influence n'a pas été directe.

On n'a pas remarqué une période diurne de la direction du vent. Vu l'importance pratique qu'une pareille variation aurait possédée pour nous, elle ne nous aurait pas échappé. Des changements qui pourraient être expliqués de cette façon, se rencontrent le 26 juin et surtout le 5 et 6 juillet.

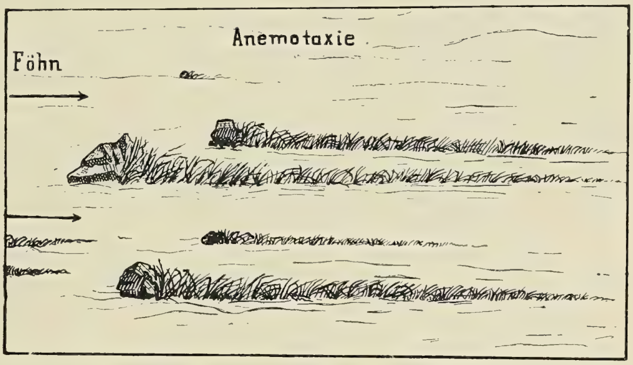
c) L'influence de la direction constante des vents sur les plantes à la côte est.

Le fait de l'adaptation de la forme des plantes au vent prépondérant est un phénomène connu, pour lequel nous proposons le nom d'»anémotaxie«. Pour la côte est du Grönland N. Harz a attiré l'attention sur certains cas produits par le föhn. Nous pouvons donner une contribution en citant une observation qui n'a pas encore été décrite. Au bord nord de la »Baie des chiens« (voir la carte, planche II) deux torrents provenant de l'inlandsis, formaient un petit delta assez plat et dans lequel il y avait çà et là quelques pierres et reliées avec ces dernières, des plantes herbacées, surtout des »Carex«. Les plantes se trouvaient du côté opposé au vent, mais pas seulement dans le voisinage immédiat de la pierre, mais formaient une queue absolument droite, diminuant peu à peu et longue de quelques mètres. L'explication nous a été donnée sur place par un vent de föhn tellement violent, qu'il nous obligeait par places, d'aller à quatre pattes, pour ne pas être jeté contre les rochers. Ces raies de végétation correspondaient absolument à la direction du vent (N) que le föhn doit avoir dans cette vallée, et l'importance et la constance de cette direction du vent se traduit

par les énormes amas de neige, portés dans cette vallée par le föhn. — J'ai retrouvé le même phénomène au bord du Grand-Sermilik. L'esquisse ci-jointe fait voir comment le phénomène se présente.

3. Humidité de l'air et évaporation.

Le tableau suivant fait voir les conditions moyennes de l'humidité relative sur l'inlandsis et particulièrement dans la région centrale.



Il s'en suit une humidité relative moyenne, très élevée, de 82 % et une très petite variation diurne, entre 72 et 92 %. On attribuera cette grande humidité relative sur l'inlandsis et sa petite variation à l'évaporation constante de la surface de glace ou de névé. Il faut cependant examiner dans quelle mesure on est en droit d'admettre l'évaporation et dans quelle mesure il peut y avoir aussi une condensation avec tendance à la compensation.

C'était une des dernières recommandations de l'ami de notre expédition, le très regretté F. A. Forel, de ne pas perdre de vue le problème de l'évaporation. Nous ne possédions pas alors la balance évaporomètrique que mon ami Piccard a construit pour la Commission zurichoise des glaciers. La discussion de ce problème devait donc se baser sur des mesures de la température de la surface et leur différence avec la température de l'air. L'évaporation dépend de la température de la surface évaporante, du déficit de saturation, de la vitesse de ventilation et de la pression. Pour la pression normale, Trabert a employé la formule suivante: $V = c\,(1 + at)\,.\,(E - e)\,.\,\sqrt{W}$. Dans cette formule W signifie la vitesse du vent en mètres par sec. et c une constante, qui se rapporte à l'évaporation en mm par 24h. Si l'on veut tenir compte de la pression, il faut l'introduire comme facteur $\frac{p_0}{p}$. Comme on va voir, nous possédons toutes les données pour établir ce calcul.

En tenant compte de la marche diurne de l'humidité pour la zone centrale et pour la zone bordière et en utilisant les variations de température déduites plus haut, on a d'abord pu calculer le tableau suivant. Il indique de combien la température de la surface diffère

encore du point de rosée de l'air et en plus, qu'elle était le déficit de saturation $E - e$ (E signifie la tension de la vapeur d'eau maximale, pour la température de la surface, e signifie la vraie tension de la vapeur d'eau contenue dans l'air).

	8h a	2h p	9h p	Maxim.	Minim.
1. Inlandsis:					
a) Tout les jours					
Humidité relative	80	77	85	97	57
Tension de la vapeur d'eau	2,9	3,5	3,0	4,9	1,0
b) Jours avec temp. au-dessous de —7,5°					
Humidité relative	79	73	88	95	62
Tension de la vapeur	1,8	2,2	1,8	2,6	1,0
2. Bord de l'inlandsis (groupe ouest):					
Humidité relative	74	71	79	100	52
Tension de la vapeur	4,9	5,3	5,0	7,1	3,5

Bord de l'inlandsis: Humidité relative = 79 %, Tension de la vapeur 4,6.

a) Différence du point de rosée de l'air b) déficit de saturation.

	0h a	3h	6h	9h	12h	3h p	6h	9h	Moyen du déf. de saturation
									mm
Zone centrale									
Temp. au-dessous de —7°5 a) degrés	—0,7	0,5	2,9	4,7	6,1	3,3	1,6	0,0	—
b) millim.	—0,07	0,06	0,41	0,87	1,33	0,88	0,32	0,01	0,48
Zone bordière intérieure									
Temp. entre 0° et —7°5, a) degrés	0,4	1,3	3,2	3,4	2,5	2,4	1,7	0,8	—
b) millim.	0,10	0,34	0,95	1,00	0,77	0,73	0,54	0,24	0,58
Zone bordière extérieure									
Temp. au-dessus de 0°, a) degrés	0,5	1,3	2,0	0,9	0,6	0,8	1,7	1,1	—
b) millim.	0,15	0,40	0,63	0,30	0,21	0,26	0,53	0,33	0,35

Ces chiffres ne prétendent pas à autre chose, qu'à une première orientation mais qui en elle-même est assez intéressante:

Les conditions de la condensation existent à peine en été, et ceci seulement pendant les heures de la nuit de la zone centrale (chiffres négatifs pour la différence au point de rosée et le déficit de saturation), l'évaporation maxima possède son maximum dans la zone bordière intérieure. La zone extérieure donne une évaporation plus petite, mais l'échauffement des masses d'air, qui parviennent ici, ne dépasse pas suffisamment la température de 0°, pour que la surface de la glace puisse déjà agir comme condensateur, (comme c'est le cas par exemple pour les langues de glaciers descendant très bas dans les vallées alpines. F. A. Forel). Cette tendance se marque seulement par un minimum

secondaire de l'évaporation vers midi. Le déficit moyen de saturation pour toute la durée de la traversée est 0,50 mm; si on ne prend que les jours au-dessus de 0°, cette valeur devient 0,53 mm.

La vitesse du vent étant bien connue, il nous manque seulement la constante d'évaporation. Cette détermination a été faite par J. Westman; il a trouvé, avec des surfaces de neige restreintes, la valeur 0,5. Nous avons cru utile de faire nous-même une détermination indépendante, dont les conditions soient aussi près que possible de celles rencontrées sur l'inlandsis. J'ai trouvé pour ce coefficient la valeur de 0,56, qui se rapproche donc beaucoup de la constante de Westman. Avec cette dernière constante on trouverait pour les conditions de l'inlandsis une évaporation moyenne de 0,56 mm par jour, pour un jour d'été de l'inlandsis; si l'on tient compte de la pression moyenne de 626 mm, cette valeur monte à 0,68 mm. Pour tenir compte de l'influence des jours couverts, auxquels l'évaporation est sans doute plus petite, mais qui n'ont pas été considérés dans ce qui précéde, nous diminuerons aussi l'évaporation de 50 $^0/_0$.

Tâchons de nous rendre compte de la signification de cette évaporation en nous demandant par exemple, combien d'humidité quitte l'inlandsis en été, sur 1 m de longueur du bord. J'ai trouvé 85 m^3 transportés par le vent du SE. Un courant d'air de 300 m de hauteur, de 2 m de vitesse et d'environ 33 $^0/_0$ d'humidité y suffirait. Ce sont donc des conditions que seront facilement réalisées.

Comparons encore la perte par évaporation, à la perte par ablation; cette dernière peut être évaluée en moyenne à 1,15 m; On trouve sur un ruban large de 1 m qui va jusqu'à la limite du névé une ablation de 77 m^3 pour les journées de l'été. Si nous comptons pour cette durée 90 jours, d'ablation, nous trouverons 860 m^3; pour la même section le vent emporte 85 m^3, ce serait donc $^1/_{10}$ de l'ablation. Si on avait voulu faire un calcul plus rigoureux il aurait fallu corriger l'ablationelle-même.

Il y a lieu de mentionner ici les quantités de neige chassées par le vent. C'est sans doute une facteur de l'économie de l'inlandsis qui n'est pas négligeable, mais il n'est guère possible de l'évaluer au point de vue quantitatif.

On est tenté d'évaluer si possible la perte annuelle due à l'évaporation. Le refroidissement par rayonnement hivernal favorise la condensation, mais le mouvement d'air intense qui est déterminé par ce refroidissement ne permettrait pas, même en hiver, un très fort refroidissement de la température de la neige, au-dessous de la température de l'air. En plus, les températures très basses, au point de vue absolu, ne permettront ni une évaporation, ni une condensation, qui soit un peu importante. Si nous admettons que pour l'hiver, l'évaporation est compensée par la condensation et si nous laissons augmenter l'évapora-

tion vers l'été jusqu'à son maximum, la somme annuelle serait d'environ 55 mm. Ce chiffre signifie simplement un ordre de grandeur, qui peut facilement être trop petit ou trop grand de la moitié.

Si cette évaporation n'avait pas lieu, il arriverait 15000 m^3 de glace de plus au bord de l'inlandsis par mètre de longueur, celà suffirait pour étendre l'inlandsis de 7 à 8 km de plus vers l'ouest, dans les rochers de la côte.

4. La nébulosité.

La nébulosité moyenne pendant notre traversée était de 4,6 dixièmes. Pendant 31 jours d'observation il y a eu 16 $^0/_0$ de ciel couvert, $52^1/_2$ de ciel nuageux (nébulosité 2—8) et 31 $^0/_0$ de temps clair (nébulosité inférieure à 2). Le temps était donc beaucoup moins nuageux qu'au bord de l'inlandsis (4,6 dixièmes) et aussi sensiblement plus clair que pendant la traversée de Nansen (50 $^0/_0$ de jours couverts, nébulosité moyenne 6). Il n'est pas certain que cette différence ait une signification climatologique; cependant il est probable que c'est l'influence systématique des dépressions qui, en automne, et quelques 100 km plus au sud devait se faire sentir davantage.

On constate encore une augmentation de la nébulosité au courant de la journée.

a) Les formes de nuages.

A part le Cumulo-Nimbus (nuage d'orage) toutes les formes de la classification internationale ont été notées; nous attirons l'attention particulièrement sur l'observation de Cumulus, dont on prétend en général qu'ils manquent dans la région polaire. On en a observé aussi bien à la côte (voir la figure) que pendant la traversée (5 Juillet, versant de l'ouest, 16 Juillet, versant est). Ces dernières observations prouvent que l'échauffement diurne peut produire, même sur l'inlandsis, une circulation verticale s'étendant à quelques centaines de m. Dans notre statistique les Ci-Cu ne sont pas très fréquents parce que nous avons l'habitude de noter la plupart de ces formes comme A-Cu, au niveau duquel elles appartiennent. Quant à l'altitude de A-Cu ou de A-Str, je cite une observation du 18 Juillet, où le Mt. Forel, ainsi qu'un sommet qui se trouvait plus en arrière et qui était devenu visible seulement après le camp 26, portaient seuls des capuchons de nuages qui paraissaient correspondre à A-Str ou A-Cu venant de l'est.

Il est singulier que nous ayons observé des halos seulement quatre fois. Nous avons été étonnés jour par jour de leur rareté; de même le ciel ne nous a jamais paru tout à fait clair. La remarque »brumeux«, »très brumeux« revient toujours. Ce trouble avait quelque chose de tout à fait particulier; il a frappé les Esquimaux de la côte est, et une des premières questions qui nous a été adressée a été celle, si

pendant la traversée et à la côte de l'ouest on avait observé le même phénomène. Le Bestyrer Petersen m'avait dit que les Esquimaux avaient peur que cela ne soit un signe que la prochaine année serait privée de son été!

Il s'est agi du trouble dans les hautes couches de l'atmosphère qui a beaucoup occupé les météorologistes et qu'on attribue à l'éruption du volcan Katmai en Alaska. Quant à l'époque du commencement de ce trouble au Groenland, nous pouvons affirmer qu'il existait déjà le 21, alors que le 15 juin il n'existait certainement pas. Une note du 19 juin pourrait faire penser qu'à cette date le phénomène avait déjà commencé (»A-Str mince, à travers lequel on est étonné de voir apparaître souvent le soleil comme disque tout à fait distinct et bien défini«).

b) La direction des nuages.

Il est remarquable que les nuages supérieurs Ci, Ci-Str, Ci-Cu venaient, à une seule exception, toujours du NE ou SE. Une composante ouest à été trouvée seulement le 20 juillet, déjà au bord E de l'inlandsis, alors que nous nous trouvions clairement à l'arrière d'une dépression située au SE de l'Islande. Les observations du groupe de l'ouest indiquent aussi cirrus d'ouest le 20 juillet. Si cette direction prépondérante de NE à SE possède une signification générale, c'est en tout cas celle que pendant la traversée nous nous trouvions décidément au nord des centres d'action situés à l'est et à l'ouest du Groenland.

Quant à la direction des nuages moyens et inférieurs, on la compare avec le vent observé au sol pour se faire une idée à quelle altitude ce dernier s'étendait. Cette altitude n'était quelquefois pas très grande. Le 23 juin par exemple, on a observé sur l'inlandsis comme à son bord (distance 30 km) un vent du SE au S—SE de 5—8 m alors que les A-Cu avaient un vent du NW décidé. Le 25 juin on observait sur l'inlandsis au sol S—SE 7 m, aux A-Cu sud-sudouest. Le 28 juin nous avons au sol est-sudest 5 m avec A-Cu immobiles. Par rapport au vent observé au sol la direction du vent du niveau moyen a une tendance à tourner à droite. Ce changement de direction est en moyenne de 43°. Nous citons encore le cas du 5 juillet, qui permet d'admettre qu'à 500 m au-dessus de l'inlandsis, le vent n'a pas plus de 1 m, alors que au sol le vent était SE de 4 m.

Nous avons trouvé plus haut que le vent mesuré au sol déviait de 55° de la pente maxima. Le vent au niveau des A-Cu dévie donc déjà d'environ 100° dans cette direction; cela veut dire qu'il est déjà dirigé un peu contre la pente, et il ne faudra pas beaucoup pour que la formation de précipitations soit déterminée.

5. Précipitation et accumulation du névé.

Nous n'avons pas observé pendant la traversée de la pluie proprement dite. Une seule fois, le 19 juillet, à 1465 m, nous avons noté quelques gouttes de pluie (pendant ce temps, le groupe de l'ouest en a eu passablement au bord de l'inlandsis). Des chûtes de neige ont été observées à 6 jours différents, ou au moins supposées. En effet, il y avait en même temps un vent ou une tempête violente qui laissait quelquefois des doutes s'il s'agissait d'une vraie chute de neige ou d'un chasse-neige seulement. Pour la même raison, on ne peut rien dire de certain sur la quantité de précipitations tombée. J'estime que la hauteur totale de neige tombée pendant la traversée à nos camps successifs n'a pas dépassé 17 cm, ce qui équivaudrait à 4—$2^1/_2$ cm d'eau.

Il importe de constater que dans tous les cas des chutes de neige, le vent avait tourné à droite et soufflé du S au SW — c'est à dire contre la pente. Nous citons le cas très intéressant du 15 juillet, où nous nous trouvions déjà à la côte est et avions d'abord un vent du nord-ouest avec temps assez clair; mais vers l'après-midi, le vent du sud-est (d'un minimum qui se trouvait sur la côte de l'ouest) se faisait sentir par dessus l'altitude maxima jusque vers nous; immédiatement le ciel se couvrait et il neigeait aussi longtemps que durait ce vent du sud-est; ce dernier jouait sur le versant de l'est le rôle d'un »fœhn«, qui donnait des précipitations en montant la pente.

Accroissement annuel du névé.

Dans nos sondages réguliers, contrairement à notre attente, nous n'avons pas pu traverser plusieurs couches annuelles successives. Dans un certain nombre de cas on a déterminé aussi la densité des couches. J'ai aussi employé les constantes que nous avons trouvées dans les Alpes, là où le caractère du névé paraissait le justifier. Je peux même constater que c'étaient précisément les expériences faites à notre première visite de l'inlandsis en 1909 qui m'ont engagé à proposer à la Commission zurichoise des glaciers, un programme de travail qui prévoyait spécialement ces recherches. Dans les Alpes nous employons la sonde nivométrique de Church que je ne connaissais pas encore en 1912, et pour fixer les couches annuelles nous colorons les surfaces avec une poudre insoluble (terre de Sienne). Sur l'inlandsis, on pouvait se fonder sur les couches transformées en glace, qui, dans les Alpes ne sont pas nécessairement des couches annuelles, alors que sur l'inlandsis on peut y compter quand on pense au changement entre une nuit polaire de plusieurs mois de durée et un été continuel de la même durée. Il y a cependant des régions de l'inlandsis, aux hauteurs faibles, où ces couches ne peuvent pas se former parce que toute la neige serait imbibée d'eau de fusion. D'un autre côté, il y a des régions très élevées, où la tempéra-

ture de l'été est trop basse pour permettre la formation de ces couches de glace dues à la fusion superficielle.

C'est en effet ce que nous avons trouvé sur l'inlandsis. A partir du camp 4 jusqu'au camp 13, nous avons constaté une couche de névé dure; à partir du camp 14, nous avons rencontré 7 cm au-dessous de la surface une couche très dure de 10 cm d'épaisseur sous laquelle il y avait un névé qui n'avait pas de limite inférieure certaine. Du camp 15 au camp 18, on pouvait très bien distinguer une couche de glace supérieure (formée au printemps et en été 1912), plus bas une couche de neige poudreuse comprimée (formée d'après notre idée depuis l'automne 1911 jusqu'au printemps 1912), et encore plus bas une couche de glace très bien marquée que nous n'avons pas pu pénétrer et qui correspondait à la fusion de l'été 1911. Dans la zone la plus élevée du camp 19 au camp 22 ces deux limites manquent, mais elles reviennent à la descente, à partir du camp 23 jusqu'au camp 26. Mais le camp 28 montre encore un profil normal.

Nous nous croyons donc en droit de déduire de ces sondages les valeurs annuelles d'accroissement exprimées en hauteurs d'eau. Leur concordance justifiera encore davantage ce procédé.

Valeurs en eau de l'accroissement annuel de névé de l'inlandsis.

Versant W, camp	11	12	13	14	15	16	17	18
Altitude m	1831	1888	1936	2046	2176	2243	2318	2399
Accroissem. du névé, valeur en eau cm	35,0	33,5	26,5	(25)	34,2	54,4	44,0	39,5
Versant E, camp	23	24	25	26	27	28	Moyenne	
							Versant W	Versant E
Altitude m	2258	2254	2084	1861	1465	1236		
Accroissem. du névé, valeur en eau cm	26,1	33,6	33,6	34,0	35,3	39,2	36,2	33,6

La concordance de ces chiffres, qui sont trouvés d'une façon indépendante l'un de l'autre, paraît très remarquable; la moyenne pour la côte ouest est de 36,2 cm, celle pour la côte est 33,6 cm. Nous pouvons prendre la moyenne de 35 cm comme valeur de l'accumulation de l'été 1911 à l'été 1912. Au point de vue météorologique, il faut y ajouter la valeur de l'évaporation. Nous avons apprécié celle-ci comme étant de 5,5 cm. La précipitation météorologique serait donc de environ 40,5 cm. Ces données, basées sur les observations d'une seule année, pourraient paraître bien fortuites, mais une fois de plus, nous pouvions profiter du fait que notre profil a été situé entre deux stations de base qui permettent la réduction à une série d'années. La précipitation

observée de juillet 1911 à juin 1912 à Jakobshavn est de 22,4 cm, c'est à dire égale à 89 $^0/_0$ de la valeur moyenne de 1901—1910. La somme trouvée pour Angmagsalik pour la même période de 1911—1912 est de 114,1 cm, c'est à dire 114 $^0/_0$ de la valeur moyenne de dix ans. La réduction de la précipitation sur l'inlandsis à la valeur moyenne de Jakobshavn donnerait donc 45 cm. La réduction à Angmagsalik donnait 35,5 cm. Nous revenons donc à la valeur de 40 cm, comme précipitation météorologique et d'environ 34,5 cm comme accumulation corrigée de l'évaporation probable.

L'évaluation de ce chiffre nous paraît avoir une signification considéarble pour juger de l'économie de cette région de l'inlandsis grœnlandais. Nous allons montrer dans quelle mesure cette valeur concorde avec les idées que nous devons nous faire d'après la théorie de l'écoulement d'un glacier, établie par Finsterwalder, du rapport entre l'accumulation A et l'ablation a. Le collecteur FA se figure dans le dissipateur fa d'après la loi que $FA : fa = a : A$. Dans notre cas, les divergences des filets d'écoulement est très petite. Il est donc permis de diviser l'inlandsis en glaciers partiels; les bords sont parallèles et perpendiculaires à l'axe de l'inlandsis. Le rapport des surfaces $FA : fa$ pourra donc être remplacé par le rapport des distances jusqu'à l'altitude maxima de l'inlandsis. Ce rapport ne change pas si nous remplaçons les distances mesurées perpendiculairement à l'axe de l'inlandsis par celles trouvées pendant la traversée, qui était suffisamment réctiligne. Nous y avons rencontré la limite du névé à environ 100 km de l'inlandsis, et l'altitude maxima encore 330 km plus loin. D'après cela, l'ablation moyenne serait $a = \frac{FA}{fa}$, $A = \frac{330}{100} \cdot 34{,}5 \text{ cm} = 1 \,.\, 14 \text{ cm}$. D'après E. von Drygalski l'ablation au bord de l'inlandsis est de 2 m environ et Mercanton a déduit de ses observations une valeur de 2,3 m par an. La moyenne de l'ablation serait donc de 1 m à 1,15 m. Le résultat déduit de nos observations sur la limite du névé et sur l'accumulation approximative concorde donc aussi bien qu'on pouvait l'attendre. Nous trouvons sur l'inlandsis réelle un petit excès de l'ablation calculée. Il nous semble qu'il ne faut pas trop insister sur cette différence quand on pense aux bases sur lesquelles notre calcul repose. Ce sont des bases qui, autant que nous savons, n'existent pas même pour un glacier alpin. Mais, si on voulait insister sur une explication, ce serait celle-ci: une certaine partie du bord de l'inlandsis ne fond pas mais s'en va sous forme d'isbergs sur la mer.

Mais, ce qui est important à retenir, c'est la constatation faite ici pour la première fois sur des bases suffisamment sûres, que l'inlandsis pris comme glacier, se trouve en équilibre stationnaire, en première approximation, et que dans les conditions actuelles d'existence il n'a aucune tendance marquée à disparaître.

Les lacs sur l'inlandsis. C'était un phénomène très caractéristique de la zone d'ablation et qui faisait voir en même temps d'une façon ostensible les gradins de l'inlandsis. Un certain nombre de détails se trouvent dans le journal météorologique et topographique. Nous résumons en constatant que le premier lac (écoulé celui-là) se trouve déjà sur le second gradin, à 9,5 km du bord de l'inlandsis à 1690 m de hauteur; le second, rempli, à 12 km de distance et à environ 800 m de hauteur. De là, nous les avons rencontrés, beaucoup plus souvent que nous le désirions, jusqu'à 107 km du bord; on notait le dernier à 1530 m de hauteur. Avec ces lacs cessaient aussi les gradins bien visibles. (Voir le ruban de la traversée à la planche I).

Dans la région située plus près du bord de l'inlandsis, où il n'y a presque plus de neige sur la glace, ces lacs, dont l'étendue ne dépasse guère un km, avaient des affluents superficiels et de même un effluent très fort. Plus haut, où la glace était couverte de neige, les affluents aussi bien que les effluents manquaient de plus en plus. Ici, les lacs étaient formés par une nappe en quelque sorte souterraine, l'eau de fusion de la neige descendant jusqu'à la glace imperméable, formant enfin un lac et quelquefois aussi un cône de glace. L'écoulement du premier lac rencontré a dû se faire par un gouffre vertical comme nous en avons rencontré en fonction. Il faut admettre que les lacs exercent une certaine action d'érosion sur leurs bords parce que l'eau est un peu chauffée par le soleil et cette eau chauffée, étant plus dense, doit descendre au fond. Ainsi les lacs se creusent automatiquement. D'un autre côté, la couverture de glace d'un lac qui est écoulé est beaucoup plus pure que la glace un peu grise de l'inlandsis. Cette glace forme donc des sortes de tables glaciaires. Quant à la profondeur de ces lacs, nous l'avons constaté personnellement dans un certain cas, à environ 30 m du bord; elle était de 3 m. Au milieu elle peut facilement atteindre 5 m et davantage.

La limite supérieure d'altitude des lacs doit correspondre en même temps à la hauteur maxima du névé, où d'année en année des névés s'accumulent, les conditions pour conduire au loin et pour contenir une nappe d'eau superficielle disparaîtront.

6. La limite du névé.

La saison (fin juin) à laquelle nous avons traversé la zone en question de la côte de l'ouest ne permettait pas la constatation directe de cette limite. Cependant, si nous concentrons toutes nos observations sur la profondeur de la neige, sur les lacs, sur l'existence de névé ancien et de glace, nous pouvons constater que cette limite n'est pas plus rapprochée de notre point de départ au bord de l'inlandsis que de 80 km et en tout cas pas plus éloignée que de 120 km. Nous l'admettrons

donc dans la direction de l'itinéraire, éloignée de 90—100 km (ce qui, mesuré perpendiculairement au bord de l'inlandsis ferait 80 km). Pour l'altitude, nous admettrons 1450—1500 m, ce qui n'est pas beaucoup plus haut que la limite du névé au nord des Alpes à l'époque glaciaire.

A la côte est, ou l'inlandsis était encore couvert de neige à la hauteur ou nous l'avons quitté, 820 m, le 21 juillet, ce niveau est beaucoup plus bas; il nous semble descendre à 1000—1100 m et peut-être même davantage.

Il serait sans doute possible de déterminer la limite du névé avec une précision encore plus grande et d'une façon plus indépendante du hasard du temps de l'année de notre visite. Il faudrait pour cela disposer de moyens et d'un temps plus amples que ce n'était le cas pour nous. Pour distinguer une glace ancienne et des couches de glace formées par la fusion et la congélation du névé, on pourrait se servir de déterminations de la grandeur du grain.

La limite du névé a été trouvée par nous sur le versant ouest à un niveau plus élevé que nous n'attendions. On peut comparer la remarque des habitants de la côte, que l'hiver 1911—12 avait donné moins de neige qu'en général. D'un autre côté, la précipitation 1911—12 à Jakobshavn était plus forte que la moyenne de dix ans; en tout cas le fait remarquable reste acquis que la limite du névé sur l'inlandsis est considérablement plus élevée qu'à la côte de Disco où les hauts plateaux, à partir de 1000 m, portent déjà des névés étendus et forment des glaciers, comme Mr. Jost qui en août 1913 a visité ces régions, me l'aconfirmé expressément. En effet pour faire une juste comparaison, il importe que les conditions morphologiques soient semblables à celles de l'inlandsis, car plus nous approchons du pôle, plus la limite du névé est une fonction de l'exposition et toujours moins une fonction de l'altitude au-dessus de la mer. Dans notre cas il est certain qu'à partir de la région côtière et à l'intérieur de l'inlandsis, la limite du névé monte, ce qui est un parallèle très remarquable avec la montée de la limite du névé des Alpes suisses. Comme explication de ce phénomène dans les Alpes, j'ai pu démontrer une élévation analogue des isothermes de l'été vers l'intérieur des Alpes, alors que la diminution des précipitations pour un même niveau paraissait secondaire. Par contre au continent grœnlandais c'est la décroissance des précipitations de la côte vers l'intérieur que paraît être le phénomène décisif; l'insolation intense du ciel, plutôt anticyclonale, de l'inlandsis y joue aussi un rôle.

Ainsi, la fin de nos considérations sur l'inlandsis grœnlandais retourne aux recherches dont nous sommes partis dans nos Alpes suisses.

Quatrième Section.

Observations faites en commun sur la côte occidentale

par A de Quervain et P. L. Mercanton.

Ascension de la montagne Hjortetakken le 17. Avril 1912

par A. de Quervain.

La première ascension de ce sommet, situé près de la colonie de Godthaab et renommé jusque là comme inaccessible, à été exécutée au printemps 1909 par E. Bäbler avec A. de Quervain. La seconde ascension, dont il est question ici, à pris un chemin assez différent et fait des mesures exactes de la hauteur. Nous sommes partis en bateau à 9^h45 du matin du port de Godthaab. En route, on a constaté à la côte de la Store Malene des stries glaciaires avec direction E 39°S et E 32°S. Il y avait 30—40 cm de neige. A 11^h30 nous avons commencé l'ascension à la plage au pied du Hjortetakken en nous dirigeant vers le sommet arrondi à droite. 12^h30, première halte à 345 m de hauteur. Continué dans la direction E 30°S vers une échancrure, visible à droite de notre cliché. A 1^h45 nous avons atteint la pente qui se trouve de l'autre côté de cette échancrure à 625 m de hauteur. L'arête qui court vers le sommet principal, possède la direction E 20°N. Nous sommes arrivés d'abord sur le sommet arrondi que nous appelont Petit Hjortetakken, en utilisant un couloir. Température sur ce petis sommet: —11°5. Altitude réduite 919 m. Chasse-neige. A 8^h nous avons atteint, à 880 m, la partie la plus abaissée de l'arête qui court du Petit au Grand Hjortetakken. L'ascension de cette arête n'offre pas de difficultés notables. Cependant, elle ne se termine pas avec le sommet principal, mais avec un sommet secondaire, duquel il faut faire une traversée très exposée, surtout par le chasse-neige qui nous accompagnait. Altitude du sommet principal, atteint à 5^h15 p, 1172 m. Le petit »cairn«, érigé par Bäbler et moi en 1909, était enseveli

dans la neige. Il y avait, dans cette tempête de neige, un gradient thermique vertical de 0,87°. Il se formait du givre. La descente s'est effectuée par le chemin choisi par Bäbler et moi en 1909, soit le cirque qui sépare

Téléphot. Mercanton avril 1912.

Le Hjortetakken près de Godthaab.

A gauche: le sommet (1172 m), à droite: le Petit Hjortetakken (919 m), au milieu: le grand couloir.

le Grand et le Petit Hjortetakken. Le fond du cirque est à 692 m; la descente a continué par le couloir très incliné et très marqué, rempli de neige. Vu depuis Godthaab, il paraît vertical. Ce couloir, rempli de névé, est le dernier reste d'un petit glacier, nourri par le cirque qui, actuellement ne contient plus de glace ni de neige durable. Il est intéressant que, au pied de ce couloir, environ 100 m au-dessus de la mer, on

remarque de belles moraines frontales qui correspondent apparemment à un stade que j'ai observé en 1909 à l'intérieur du Fjord de Godthaab au nord du Angpalartok (environ 1450 m) et du Kingak (environ 1600 m). Ceci est un stade qui pourrait correspondre à peu près à notre „Daun-stadium" alpin, et où l'inlandsis devait se trouver encore très loin à l'intérieur des Fjords (peut-être vers Kornak). — La première formation du cirque sus-mentionné est très caractéristique et dû à ce couloir qui lui-même indique une de ces lignes de clivage qui se répètent fréquemment. Au point de vue de la forme de cette montagne, on remarque la différence entre les contours absolument arrondis de l'épaule appelée Petit Hjortetakken et de la forme alpine du grand sommet, qui, en vérité est formé par une arête peu étendue qui court dans la direction NS. La hauteur de l'épaule (920 m) fait voir quelle a été le niveau minimum de l'action de l'inlandsis. Mr. Mercanton souligne la formation régulière du cirque. Il y a constaté la nature du rocher; c'est du gneiss, avec des filons micacés nombreux et beaucoup de hornblende.[1])

Excursion dans la région du Fjord Sermilik près de Sukkertoppen (21—23 Avril)

par A. de Quervain.

Notre but s'est trouvé à environ 35 km de Sukkertoppen dans la direction N 35°W. La petite carte, copiée de la carte danoise, indique la situation générale. Nous sommes partis le 21 avril à 2^h15 p par le bateau à moteur de la colonie qui remorquait un bateau à rames du »Hans Egede«. A 3^h55, nous avons atteint l'entrée du Sermilik (nom, très fréquent, d'un fjord dans lequel aboutit un glacier), et à 5^h30 p, le point d'atterrissage au bord droit du Sermilik et qui est éloigné encore de 4,5 km de l'extrêmité du fjord. La photographie reproduit l'aspect droit de ce fjord (gauche de la photographie). La distance jusqu'au point d'abordage est encore de 5 km. La montagne pointue à gauche est distante d'environ 6 km. Le sommet arrondi à droite est celui dont nous avons pris le panorama reproduit ici (voir la planche). A droite, au niveau de la mer, on voit le glacier fermant le fjord. Nous avons trouvé au pied de la montagne la plus haute une succession de 5 moraines terminales, qui se trouvaient toutes environ vers 140 m.

Le 22 avril, 5^h50 a, nous avons quitté notre camp qui se trouvait au bord de la mer, par une température de 5,4°. A 11^h05 a, le sommet est atteint en skis; hauteur 923 m. La vue prise du haut de ce sommet est très instructive. Un panorama photographique fait par M. Mercanton, pendant que de Quervain, Fick et Gaule prenaient

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[1]) Cf. Mémoires Soc. helvétique Sc. nat.; Vol. LIII, p. 158.

les orientations et quelques visées à l'aide d'une petite base, nous a permis de dresser une petite esquisse de carte qui explique une partie du panorama.

Explication du panorama. Le panorama commence à gauche dans la direction S 6°W avec le bord gauche du Sermilik, éloigné tout à fait à la marge du panorama, de 11 km, et de 19 km à la partie la plus distante encore visible. Le promontoire au bord droit du fjord

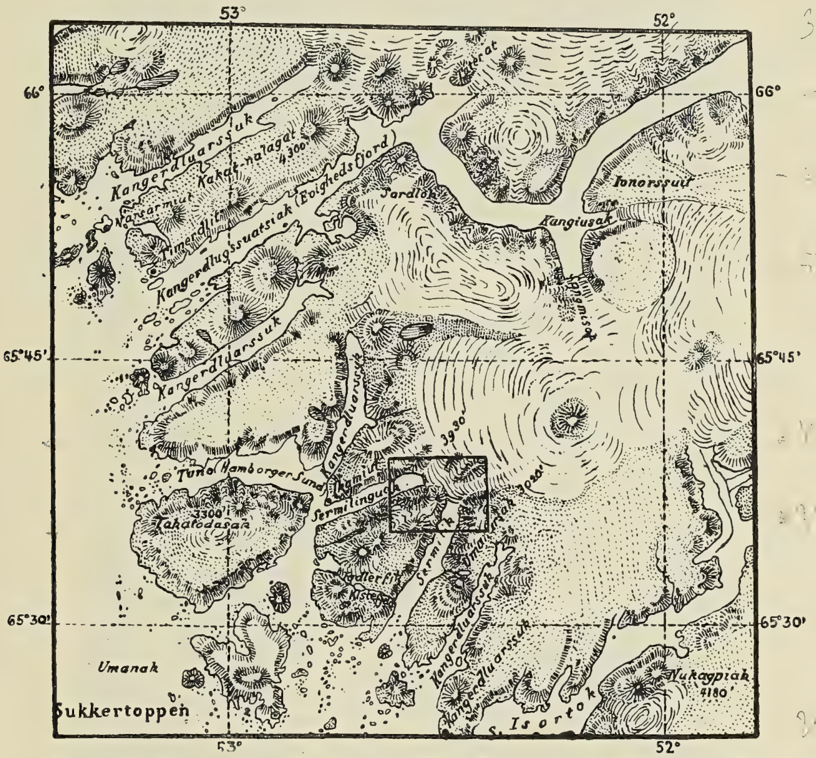
Fond du fjord de Sermilik, près de Sukkertoppen, à gauche la chaîne du Bredefjeld, à droite le Skifjeld (923 m).
Phot. de Quervain 21 IV 1912.

est à $5^1/_2$ km de distance. A droite on voit le beau groupe, aux cîmes pointues, qui correspond probablement au Kakalek de la carte marine. Ces points sont éloignés de 8—13 km, avec pointes hautes de 1100—1400 m, entre lesquelles on voit le névé du glacier qui descend vers nous et se partage vers la gauche et la droite. Cette division est invisible sur le panorama.

A droite, entre SW et W, nous avons le groupe le plus imposant, avec des distances de 1—4 km et des altitudes allant jusqu'à 1250 m. Nous avons longé le pied de ce groupe dans notre ascension. La large dent qui se trouve au W-NW à 970 m de hauteur. Ici apparaissent deux autres plans de montagnes plus éloignés, mais à des distances différentes. Les parois plus sombres sont distantes de 3—4 km, et plus loin ont voit des massifs éloignés de 5—6 km au moins. Celui qui se trouve tout à fait à droite de la première photographie a été appelé par nous Skarvefjeld; il est haut de 1300 m environ.

Le sommet large et blanc au NNW, avec lequel commence la seconde planche, appartient au flanc droit du Fjord Sermilingùak ou bien à sa

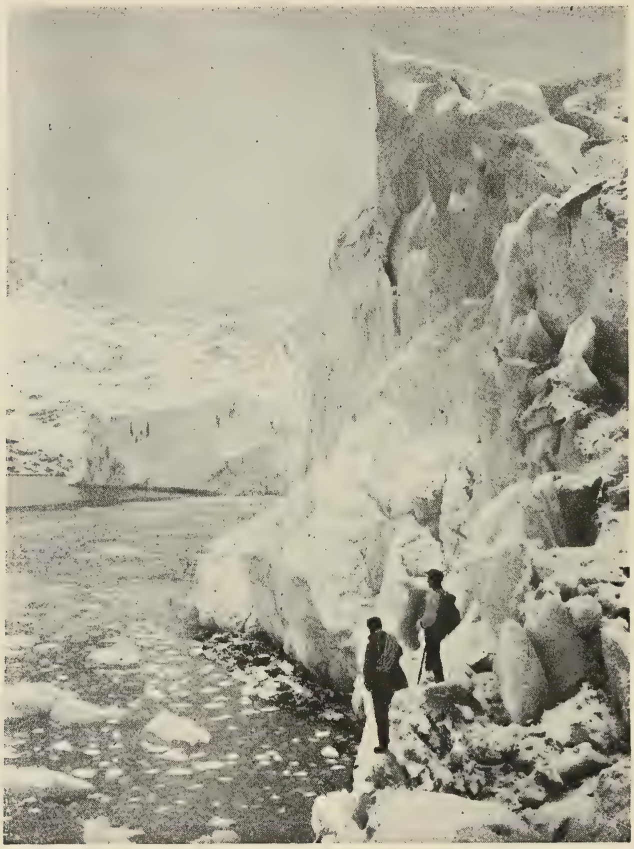
continuation comme vallée remplie d'un glacier; car le névé qui se trouve vers le N et le NE de notre sommet se divise en deux pour aboutir dans les deux fjords de Sermilik et de Sermilinguak. La hauteur et la distance des sommets entre le Nord et le Nord-Ouest est incertaine; en tout cas les hauteurs ne dépassent pas 1500 m environ. Au NNE,



Région de l'excursion au Sermilik de Sukkertoppen. 1:800000.

beaucoup plus loin que le névé, distants environ de 15—20 km, on voit des sommets très éloignés qui se trouvent probablement dans les parties intérieures du grand Evighedsfjord, qui termine toute cette région vers le nord. Le dos arrondi qui se trouve à peu près au NE et qui sépare deux glaciers, est distant de 5—8 km et haut d'environ 1300 m. Vis-à-vis de nous, vers l'est, on remarque une paroi qui tombe dans le fjord; elle est à 3 km, et haute d'environ 1050 m. Le glacier qui descend à la mer, presque vertical en apparence, a une inclinaison d'environ 20°; il est accompagné au bord du fjord de deux moraines latérales, distantes de 600 m environ, alors que le glacier n'a qu'une largeur de 300 m actuellement. Le Sermilik lui-même possède une moraine latérale qui est plus haute de 20—30 m que le niveau actuel. Le panorama s'arrête dans la direction est 29° sud avec un sommet dont l'angle de hauteur est de 4,4°. Plus à droite, on aurait vu dans la direction E 58°S encore

un sommet couvert de neige en forme de dôme et caractérisé par une paroi triangulaire noire; altitude environ 1000 m (Umanarsùk).



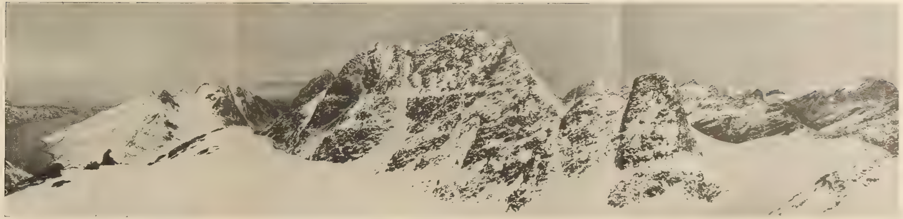
Front du Sermilik (50—80 m de hauteur).
Phot. de Quervain 23 IV 1912.

Note additionnelle sur les Glaciers du Sermilikfjord

par P.-L. Mercanton.

Ce fjord est barré à son extrémité par un puissant glacier qui dresse entre le Skifjeld et la montagne opposée une falaise de glace presque rectiligne orientée E—W. L'extrême bord gauche de cette falaise se soude au bord droit d'un glacier étroit descendant d'un haut plateau jusqu'au fjord, sur la rive orientale de celui-ci. Une moraine sépare les deux courants de glace; elle résulte de la juxtaposition des deux glaciers confluant »in extremis«. Le glacier oriental est flanqué également d'une moraine latérale sur sa rive gauche. La largeur du courant de glace

H



Panorama du Skifjeld (923 m) dans le Sermilikfjord de Súkkertoppen, Grönland W., 22 avril 1912.

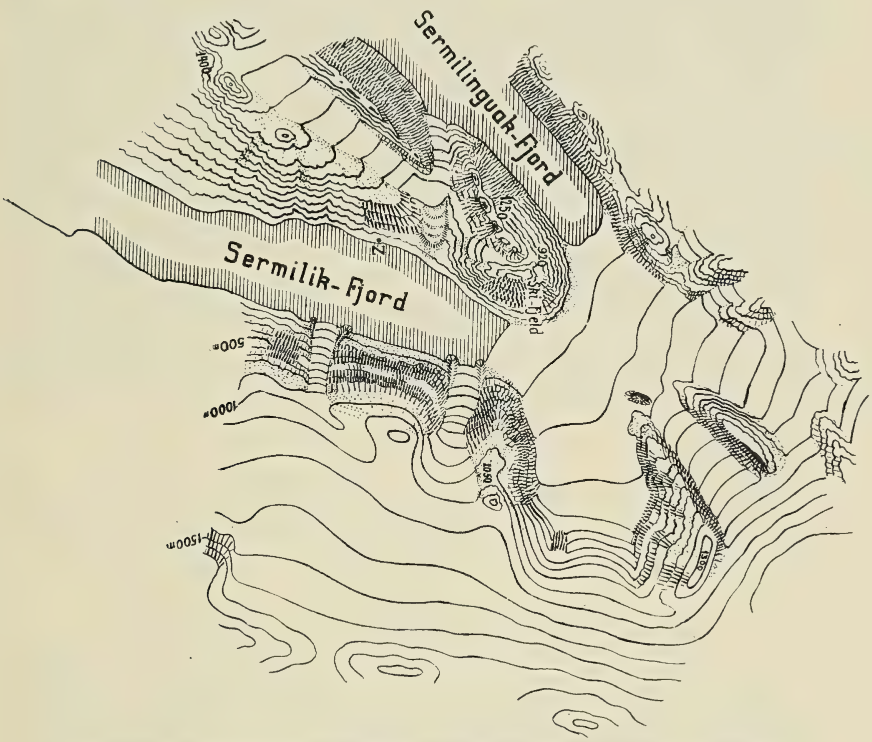
Phot Mercanton.

ne correspondait plus à celle de cet encadrement morainique: il y eu décrue depuis lors[1]).

Sur cette même rive orientale du fjord se voyaient, du nord au sud:

a) un deuxième glacier, étroit et se terminant assez haut dans la pente;

b) un troisième glacier descendant abruptement jusqu'à la mer, sur une largeur de quelques certaines de mètres.



Région du Skifjeld (Sermilik); lever pour le panorama 1: 200000.

c) une quatrième langue glaciaire poussant une avancée étroite jusqu'à cent mètres de l'eau environ.

d) une cinquième langue, descendant plus bas encore, plus large que la précèdente à sa racine, mais s'effilant rapidement; trois appareils morainiques encadraient son extrêmité.

e) une sixième langue s'arrêtant à deux cents mètres de la mer; une grande moraine la bordait au sud.

Toutes ces langues émanaient, au même niveau, du bord d'un grand collecteur en terrasse, dont elles se détachaient dans un brusque débordement sur la rive en pente du fjord.

Sur la rive occidentale de celui-ci, on trouvait, du nord au sud:

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[1]) Comme les chiffres plus précis indiqués plus haut le montrent.

a) le glacier à l'ouest du Skifjeld, descendant vers le sud jusqu'à la côte 500 m environ et se terminant par un front arrondi;

b) le glacier important qui occupe le cirque allongé entre les sommets au sud-ouest du Skifjeld. Sa langue, brusquement déviée vers le Sermilikfjord, s'arrêtait à quelque deux cents mètres d'altitude, sur un plateau. Quatre remparts morainiques encerclaient son front. Ils étaient fort bien dessinés et distants de 50 à 100 m les uns des autres. Les moraines No. 2 et 3 étaient les mieux marquées.

c) Un glacier se terminant très haut au flanc du fjord.

Ce trio d'appareils en activité était jadis complété par un quatrième, occupant, plus au sud, un ravin très profond, aujourd'hui à sec.; un système de deux moraines latérales encadre encore ce ravin jusqu'à la mer.

Les glaciers du Sermilikfjord paraissaient donc être, en 1912, dans une phase de décrue générale.

Observations morphologiques (terrasses marines) et glaciologiques faites lors du séjour à Sarfanguak et Kùk. (1.—13. mai)

par A. de Quervain.

Ce séjour devait servir avant tout à nous initier à la pratique des chiens et des traîneaux. Dans ces conditions nous avons pourtant pu faire quelques observations qui sont résumées ici.

1. Parcours de Holstensborg à Sarfangùak.

(Sur le fragment de carte ci-joint, on peut suivre ce voyage).

Le chemin direct par le fjord Amerdlok était encore fermé par la glace d'hiver; nous avons dû faire le détour par le fjord Ikertok. Nous

Contrée entre Holstensborg et Kûk 1:800000 (d'après la carte danoise).

avons trouvé que l'orientation des »gneis« correspond à la direction du fjord. Le bord septentrional de ce fjord est abrupt, ce sont des

Solifluction près de Kûk, mai 1912. Phot. Q.

ondulations de terrain qui courent vers le fjord et s'y terminent presque en coupure. Ces rochers tombant à pic qui représentent des formes récentes, servent aux oiseaux et pour cette raison apparaisent colorés

Région de Kûk; fond du fjord d'Avadtlek.
Phot. de Quervain Mai 1912.

en blanc. Ces parties se trouvent à 10 ou 15 km à l'Ouest de Sarfangùak; nous y sommes arrivés le 1 mai, après un parcours de 8^h, dans le bateau à moteur du Dr. Petersen.

2. Parcours de Sarfangùak à Kùk.

2 mai, 7,15^h à 10^h a. C'est le même système de fjord que le jour précédent; le bord septentrional a une grande pente de gneis, plongeant de 50° vers le nord. A 8,45^h, nous remarquons sur la rive droite des terrasses horizontales, très prononcées; vers 9,15^h, nous en voyons aussi à la rive gauche; d'après la carte et nos mesures d'angles, la hauteur

Terrasses près de Kûk, du point 15 de la carte.
Au premier plan, bordure de glace et gneis polis à fleur d'eau.
Phot. de Quervain Mai 1912.

serait d'environ 125 m; de même au fond du fjord vers Kùk, on voit des terrasses importantes.

3. Séjour à Kùk.

a) Remarques sur la région des lacs situés au fond du fjord.

A 1 km de l'embouchure de la rivière qui coule dans un lit profond, creusé dans les sables et les moraines, on atteint un lac, au niveau de 45 m. Il est long de 2 à $2^1/_2$ km. Le 2 mai, il y avait sur la glace du lac encore 30 à 40 cm de neige; la pente du terrain au nord était déjà assez dégagée de neige. A l'autre bout du petit lac en commençait un autre, long d'environ 12 km et possédant 3 sections, dont la première dirigée E 10°S, la moyenne, raccourcie, dirigée ENE, et la troisième, déjà voisine du Söndreströmfjord, orientée E 10°S. A environ 50 m au-dessus du lac, dans la partie moyenne, on a remarqué une sorte de terrasse. On remarque que les dos anciens, qui se dirigent vers le lac, sont attaqués par une forme d'érosion plus récente. Au sud de la

partie la plus rapprochée du lac, on constate sur la pente des moraines frontales et latérales d'un glacier disparu.

b) Les dépôts marins et glaciaires à Kùk.

Ce sont ces observations qui paraissent offrir le plus d'intérêt. Vers l'embouchure de la petite rivière nous avons observé différents dépôts. Ils reposaient sur un base de gneis, admirablement rabotée et polie

Emplacement des gîtes coquilliers de Kûk (M).
Gr: moraine de fond. S: Striation.
Lever par Fick et de Quervain.

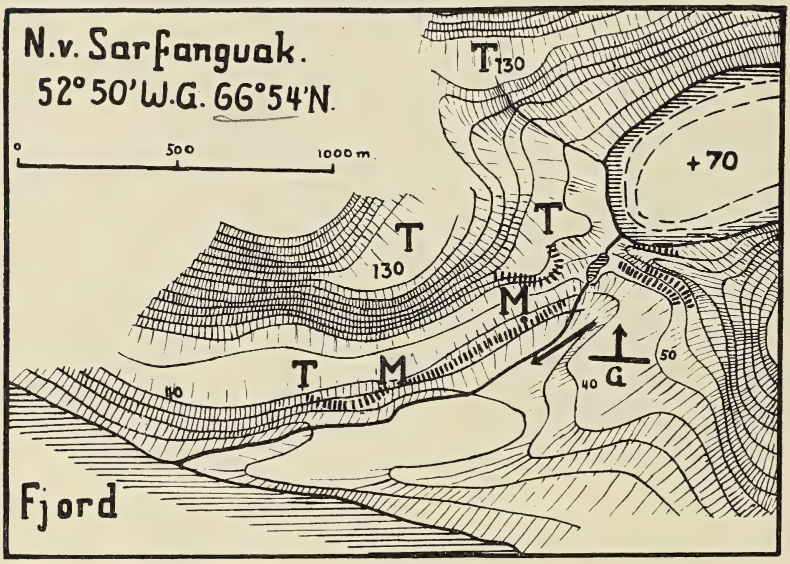
par la glace. Les stries, dont quelques unes sont larges de 2 cm et profondes de 2 à 3 mm, sont orientées toutes vers N 182—5° W. Au-dessus de ces polis glaciaires, on trouve une couche de moraine de fond, ensuite des sables marins, ensuite de nouveau de la moraine et enfin des coquilles marines. De plusieurs endroits, nous avons combiné le profil qu'on va voir plus loin. Ces endroits sont marqués sur la petite carte, qui a été relevée par Mr. Fick et par moi. La terrasse située au bord de la mer est haute d'environ 20 m, une seconde terrasse se trouve vers 40 m, d'autres à une plus grande distance, se trouvent à 70 et à 90 m, d'autres encore se constataient à 120 m. De loin on en a vu d'autres, à peu près à 150 et 180 m. La terrasse de 120 m est considérée comme marine.

Dans ces pentes légères couvertes de végétation, on observe des

cas intéressants de solifluction. Nous reproduisons une sorte de source de boue, qui a fait sauter la végétation, par suite de la pression hydrostatique. Nous croyons avoir constaté aussi, comment toute la couverture de végétation flotte sur cette couche, qui à certaines saisons est boueuse et coule très lentement dans le sens de la pente.

4. Observations à Sarfangùak.

Le 10 et 11 mai, on a trouvé de l'autre côté du fjord, au nord de



Rég. Emplacements des gîtes coquilliers de Sárfanguak.
M: gîtes. T: terrasses.

Sarfangùak des sables contenant des coquilles, à 40 et à 60 m et des terrasses plus élevées, vers 130 m (voir la petite carte ci-jointe).

Des phénomènes de solifluction ont été très bien observés.

De même nous avons pu observer une fois de plus, combien l'état de conservation des surfaces gneissiques polies par le glacier, dépend des conditions de stagnation de l'eau: là où l'eau reste stagnante sur ces surfaces, elles sont réduites en débris et miettes, alors que les côtés où l'eau ne peut rester sur le rocher, ce terrain possède encore une surface absolument intacte.

5. Examen des fossiles trouvés à Kùk et à Sarfangùak.

Nous avons eu la chance de faire examiner les fossiles trouvés par nous par Mr. V. Nordmann de l'Institut géologique de Copenhague, qui est connaisseur spécial de la fauna en question. Voici ce qu'il nous a communiqué comme résultat:

»Ich habe jetzt die mir zugesandten Mollusken aus der Gegend von Holstensborg untersucht. Die Untersuchung der Balaniden wurde von Herrn Amanuensis am Zoologischen Museum K. Stephensen übernommen. Das Resultat ist wie folgt:

1. Strandterrasse in 40—60 m gegenüber Sarfanguak, Holstensborg:
   Buccinum undatum L. 1 Exemplar.
   Pecten islandicus O. F. Müller. 4 Fragmente.

Près de Kûk: Sables marins superposés à la moraine.
Phot. de Quervain, mai 1912.

   Mytilus edulis L. Mehrere Fragmente.
   Tellina (Macerna) calcarea Chemnitz. 2 Schalen.
   Saxicava arctica L. 2 Fragmente.
   Mya truncata L. 4 Schalen und einige Fragmente.
   Balanus Hameri Ascanius?
2. Oberster Teil einer alten Strandterrasse ca. 40 m ü. M., bei Kùk, am Ende des Sarkardlitfjords, Holstensborg:
   Pecten islandicus O. F. Müller. 1 Schale.
   Mytilus edulis L. Einige Fragmente.
   Tellina (Macerna) calcarea Chemnitz. Eine Schale.

Tellina (Macerna) baltica L. var. Grönlandica Bech. 3 Schalen, 1 Fragment.
Saxicava arctica L. 10 Schalen.
Mya truncata L. 8 Schalen und einige Fragmente.
Balanus percatus Da Costa.
— crenatus Brugnière.
— Hameri Ascanius?

3. Sandschotter rechts, ca. 5 m über Hochwasser, aber abgerutscht, wohl aus ca. 15 m über M. Kùk bei Sarkardlit, Holstensborg:
Pecten Islandicus O. F. Müller. 1 Schale.
Cardium ciliatum Fabricius. 1 Schale und 1 Fragment.
Astarte (Nicania) Banksii. 1 Schale.
Tellina (Macerna) calcarea Chemnitz. 1 Schale.
Saxicava arctica. 13 Schalen und 1 Fragment.
Mya truncata L. 12 Schalen und wenige Fragmente.
Balanus percatus Da Costa.

Alle die vorliegenden Arten sind in der Jetzzeit allgemein, nicht nur in der nächsten Gegend von Holstensborg aber auch, ein paar Arten ausgenommen, fast überall an den Küsten Grönlands, sowie auch auf zahlreichen Lokalitäten ausserhalb dieses Landes.

Obwohl einige der Arten gut arktisch (wenn auch mit grosser Ausbreitung) sind, ist die hier erwähnte Fauna doch gar nicht hocharktisch, indem echt hocharktische Formen wie Portlandia arctica, Tellina Torelli und Loveni u. a. ganz fehlen. Von den gefundenen Arten kommen Mytilus edulis gar nicht, und Pecten islandicus nur sporadisch in hocharktischen Gegenden vor. (Siehe Ad. S. Jensen: On the Mollusca of East Greenland with an introduction on Greenlands fossil Mollusc-Fauna from the quartenary time. »Meddelelser om Grönland« Bd. 29, S. 300—302 und S. 322—325, und Henr. J. Posselt: Grönlands Brachiopoder og Blöddyr, ibidem Bd. 23; Ferner: The Danish Ingolf-Expedition, Bd. 2, 5; Ad. S. Jensen: Lamellibranchiata, Part I)«.

6. Résumé des observations à Kùk et Sarfangùak.

Si nous tenons compte du contraste entre les formes arrondies des rochers qui forment la surface et qui sont déjà beaucoup attaqués par l'érosion, et dans lesquelles les fjords sont enfoncés, il faut admettre une différence très considérable pour l'époque de formation de ces surfaces et de celles que nous avons vu à Kùk sous la moraine, et qui sont tout à fait fraîches. A cette dernière époque toute la région n'était pas couverte par l'inlandsis, mais il y avait des glaciers seulement dans les fjords et les montagnes portaient des glaciers locaux dont on trouve encore les traces partout. Mr. A. S. Jensen a essayé de donner un

schéma chronologique pour l'époque post-glaciaire et suppose qu'après la retraite de la grande couverture de l'inlandsis des zones côtières il y avait d'abord une faune très arctique, caractérisée surtout par Yoldia arctica et correspondant à un climat semblable à celui du nordest du Groenland actuel. Ensuite, il y aurait eu un climat un peu plus doux qu'actuellement, caractérisé par des constatations isolées du genre boréal Zirphaea crispata et de Anomia ephippium. Ensuite il y a les fossiles qui correspondent aux animaux qui vivent encore actuellement dans la mer, à la côte. Il semble que dans notre cas, on peut tenter sans contrainte les parallèles suivantes qui n'ont pas d'autre prétention que celle d'une première orientation hypothétique:

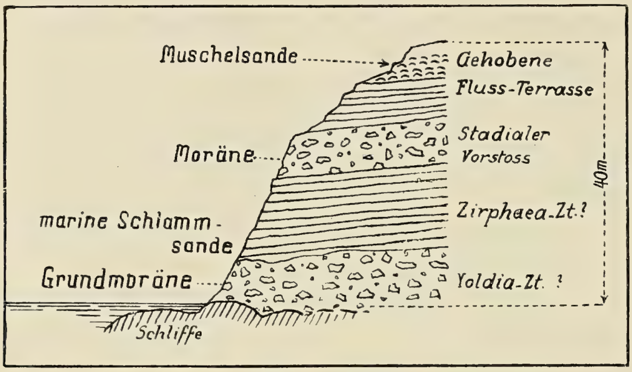
5. Sable à coquille	=	terrasse marine soulevée, avec faune récente.
4. Symptôme renouvelé d'une approche des glaciers; gravier à moraine	=	climat un peu plus glacial.
3. Dépôt de sable important	=	Stade Zirphaea.
2. Polis glaciaires frais et moraine au niveau de la mer	=	Stade de Yoldia.
1. Surface arrondie et roches à surface arrondie, relief glaciaire général déjà détérioré superficiellement	=	Maximum de la glaciation.

Nous faisons remarquer qu'un des endroits où l'on a trouvé Anomia est situé dans notre région au bord gauche du fjord Ikertok à 66°45′ N, à une hauteur de 8 m, c'est à dire correspondant au dépôt de sable No. 3, que nous attribuons à ce stade à climat moins rigoureux.

Pour terminer nous mentionnons encore quelques conséquences qui dérivent des conditions locales. Si les polis glaciaires trouvés à Kùk (No. 2) sont formés par un effluent de l'inlandsis, celui-ci aurait été plus avancé de 100 km qu'aujourd'hui, alors que l'endroit où on a trouvé Yoldia arctica dans la région, Orpiksùit, est situé seulement à 5—10 km de l'inlandsis. En présence de cette différence importante, on se demande si les polis glaciaires de Kùk proviennent d'une glaciation seulement locale ou bien, si le stade constaté par les trouvailles d'Orpiksùit sont plus jeunes. En plus, on se demande d'où venait l'eau qui amenait les sables importants des couches No. 3. Si cette eau venait de l'inlandsis, celui-ci devait se trouver à 30 km au plus, c'est à dire à la transition du Strœmfjord vers notre fjord; ce qui dirait qu'il aurait été avancé encore de plus de 60—70 km au delà de l'état actuel. Ceci ne s'accorderait pas un climat moins froid. D'un autre côté, pour expliquer par la présence de l'inlandsis lui-même les moraines constatées, on serait amené à conclure à une oscillation dans l'autre sens, qui, elle aussi, dépasserait la conception d'une variation seulement stadiale.

Pour voir plus clair dans cette question, il vaudrait mieux, au

lieu de forger des hypothèses, examiner les autres fonds du fjord Akudlek et Maligiak. Dans le premier nous croyions de loin voir une autre terrasse de 120 m. Concernant Maligiak, cette région à déjà été visitée par J. A. D. Jensen, qui y a trouvé une vallée remplie d'alluvions dont le niveau correspond peut-être aux terrasses



Observations à Kûk. Schéma hypothètique
d'après AS. Jensen.

de 25 m de Kùk. Les géologues danois nous fourniront sans doute la clé de questions auxquelles nous avons pu fournir ici seulement une petite contribution.

Observations de magnétisme terrestre

par P.-L. Mercanton.

Le programme scientifique de l'expédition ne comportait pas l'étude systématique et rigoureuse du magnétisme terrestre des régions visitées. Ni l'une ni l'autre des deux équipes expéditionnaires n'avait la perspective d'un établissement assez durable, ni de loisirs suffisants pour une recherche si délicate. L'expédition se devait néanmoins d'effectuer en cours de route, au moyen d'un outillage simple et léger, les observations sommaires propres à lui donner un aperçu du magnétisme de contrées inexplorées jusqu'à elle. D'ailleurs la connaissance approchée de la déclinaison était une nécessité vitale dans la traversée du continent grœnlandais. C'est pourquoi chacun des deux théodolites (petits universels d'Hildebrand) avait son déclinomètre. On y appréciait sans peine 0,2°. En outre, chaque théodolite avait été pourvu d'un inclinomètre amovible, également à aiguille aimantée.

Inclinaison et déclinaison se mesuraient à 0,1° près, dans le meilleur cas. Au retour, tous ces instruments ont été soigneusement vérifiés. Les erreurs des résultats n'ont pas dépassé 0,05° Le tableau ci-dessous renferme l'ensemble des valeurs définitivement acceptées:

Inclinaison magnétique.

Localité (Observateur)	Latitude nord	Longitude W. Gr.	Altitude en mètres approx.	Nature du terrain	1912 Date	Temps local	Inclinaison en degrés
Godthaab ... (M)	64°10′	51°49′	10	gneiss	8 sept.	14h45m	79°,4
Holstensborg »	—	—	—	glaciaire	23 mai	20 40	81 ,55
» (M et Q)	66 56	53 47	40	sur gneiss	26 »	13 15	81 ,55
» (M)	—	—	—	—	27 »	21 45	81 ,65
							81°,6
Egedesminde (M)	68 42	52 52	10	gneiss	6 juin	23 15	81 ,95
Godhavn.... »	69 14	53 32	10	»	6 sept.	8 45	81 ,5
Jakobshavn . »	69 11	51 5	90	»	8 juin	20 15	81 ,85
»	69 13	51 5	30	»	25 août	14 45	81 ,75
At2 .... »	69 44	50 49	10	»	20 »	19 00	81 ,85
Port-Quervain »	69 45	—	2	»	12 juin	20 45	81 ,55
Inlandsis 1.. »	69 41	49 56	789	glace	21 »	—	81 ,45
» 14.. (Q)	68 34	45 16	2046	»	5 juillet	—	80 ,6
» 15.. (F)	68 25	44 47	2176	»	6 »	—	80 ,55
» 16.. »	68 15	44 16	2243	»	7 »	—	80 ,4
» 17.. »	68 06	43 49	2318	»	9 »	—	80 ,3
» 18.. »	67 54	43 15	2399	»	10 —	—	80 ,2
» 19.. »	67 42	42 42	2457	»	10 »	—	80 ,1
» 20.. »	67 32	42 16	2491	»	12 »	—	79 ,9
» 21.. »	67 23	41 54	2501	»	13 »	—	79 ,9
» 22.. »	67 16	41 34	2432	»	14 »	—	79 ,95
» 24.. »	66 58	40 52	2254	»	16 »	—	79 ,8
» 26.. »	66 30	39 44	1816	»	18 »	—	79 ,1
isière 29.. »	66 02	38 13	822	moraine	21 »	—	79 ,0
Dépôt 30..	65 55	37 53	36	gneiss	30 »	—	78 ,6

Q = de Quervain; M = Mercanton; F = Fick. Longitude de Jakobshavn 51° 6′ W.Gr.

Ainsi donc à mesure qu'on s'éloigne du pôle magnétique boréal, l'inclinaison va décroissant, ce à quoi on s'attendait. Il est singulier toutefois que la valeur de cet élément n'ait pas baissé du bivouac 20 au bivouac 22 de la traversée. La nature du terrain sous-glaciaire, éruptive peut-être, en serait-elle cause?

Les valeurs de l'inclinaison magnétique terrestre recueillies par l'Expédition au Grœnland occidental sont toutes inférieures aux valeurs antérieurement observées.

On trouvera de plus amples détails sur ces mesures dans les »Résultats complets de l'Expédition«. Quant aux valeurs de la déclinaison, elles sont consignées dans le chapitre de la traversée, rédigé par le chef de l'Expédition.

Les Phénomènes d'optique atmosphèrique.

Radiation solaire. L'instrument utilisé était un excellent actinomètre de Crova employé par la méthode de la vitesse de réchauffement. Je me suis astreint à ne faire de mesures que par le temps serein, établi depuis plusieurs jours déjà, et toujours aux heures où le soleil était le plus haut. Voici l'ensemble des résultats:

Mesures actinométriques en 1912. Obs.: Mercanton.

Date 1912	Temps local	Calories (g et dcg) par cm² et min. sur le plan normal	Conditions de l'observation
	Holstensborg (40 m d'altitude, latitude 66°56′)		
15 mai	$9^h 59^m$ à $10^h 16^m$	1,193	Baromètre 753 mm, thermomètre —3°5 C. Ciel serein dès le 14, quelques nuages à l'horizon sur le Détroit de Davis. Baromètre en baisse.
15 »	13 52 » 14 9	1,240	Même temps.
16 »	10 7 » 10 36	1,249	Baromètre 754 mm, thermomètre —1°5 C. Ciel serein, très bleu, vent du NW. Nuages habituels sur le Détroit. Pendant la nuit précédente le ciel s'est un instant couvert de cumulus.
16 »	13 19 » 13 32	1,112	Quelques cumulus, couvert à 20^h; le 17, neige.
26 »	14 42 » 14 55	1,124	Baromètre 750 mm, thermomètre + 9° C. Ciel serein, quelques cirrus dans la matinée et le soir après.
	Port-Quervain (5 m d'altitude, latitude 69°45′)		
18 août	$14^h 8^m$ bis $14^h 21^m$	0,73	Baromètre 760 mm, thermomètre +19°5 C. Föhn, ciel serein complètement depuis le 15. Jost note que les cirrostratus ont reparu le 18, peu avant le coucher du soleil. Vers minuit couche d'altostratus développée le lendemain matin, mais disparue bientôt après. Les Ci-Str couvrent le ciel toute la journée.

La moyenne des résultats d'Holstensborg a été 1,18 cal./min. cm².

Aspect du ciel. Les troubles optiques qui ont envahi l'atmosphère en 1912, dès la fin de mai selon les uns, à la fin de juin seulement suivant les autres[1]), ont été remarqués par l'Expédition dès le 21 juin,

[1]) Cousulter: Meteorologische Zeitschrift 1912 et suiv.

du Nùnap Kigdlingâ. Le temps était, à la vérité, resté nuageux depuis le 16 juin mais auparavant personne n'avait rien observé d'insolite. Dès le 21 en revanche et pendant tout le reste de l'été le ciel grœnlandais apparut décoloré, blanchâtre pour l'observateur placé en pays rocheux, plombé pour qui voyageait sur le neige Un fin voile arachnéen, floconneux, maintefois ondulé, recouvrait tout le firmament Il rappelait le plus souvent le ciel à cirrostratus et c'est sous cette désignation que sa présence a été enregistrée au carnet météorologique.

L'escouade de l'W a noté ce voile, du 21 juin au 26 août, chaque fois que tout ou partie du ciel s'est montré exempt d'autres nuages, soit au cours de 42 journées sur 64. Il surmontait toutes les autres formations nuageuses, même les cirrus Les rayons du soleil couchant accusaient sa structure filamenteuse.

Chose étonnante, les phénomènes de halo y faisaient complètement défaut et j'ai cherché en vain le cercle de Bishop, qui d'ailleurs n'a été observé en Europe qu'une seule fois, le 15 juillet Le soleil quand il était haut se montrait, il est vrai, généralement auréolé de blanc brillant ou de violacé mais l'anneau cuivré manquait totalement.

La luminosité de l'astre était nettement affaiblie et son éclat devenait aisément soutenable à l'œil dès qu'il se rapprochait de l'horizon; il prenait alors une teinte orangée qui virait graduellement d'abord au rouge clair puis au rouge sang. Enfin le disque s'évanouissait presque soudainement, dans une brume mal définie, avant l'heure de son coucher normal.

Nous n'avons observé aucun phénomène insolite de colorations aubales ou crépusculaires.

La valeur extraordinairement faible de la radiation solaire le 18 août paraît en relation avec ces troubles optiques. Toutes réductions faites j'ai obtenu:

Holstensborg, 15 mai, 14^h .... 1,24 cal./min.cm^2
Port-Quervain, 18 août, 14^h .... 0,80 - — -

La diminution dépasse le tiers, ce que la variation annuelle normale de la radiation solaire serait impuissante à expliquer seule.

Rappelons que les troubles atmosphériques de 1912 reconnaissent pour cause première les éruptions du Katmai, volcan des Aléoutes.

P.-L. M.

Etude des roches recueillies par l'Expédition.

Rapports de MM. le Prof. Dr. Grubenmann (Zurich) † et le Dr. A. Brun (Genève). (Combinés par P.-L. M.)

L'Expédition a recueilli au Grœnland un certain nombre d'échantillons de roches. Quelques-unes proviennent des sommets visités par ses membres; la grande majorité ont été récoltées par M. Mercanton

et son escouade, tant sur la moraine frontale de l'inlandsis, au Nùnap Kigdlingâ, que sur l'îlot morainique émergeant de l'Ekip Sermiâ. Deux ou trois ont été prises par M. de Quervain dans la moraine frontale de la côte orientale, en quittant l'immense glacier.

Ce matériel a été examiné d'abord sommairement par M. le Dr. A. Brun, à Genève, puis il a fait l'objet de l'étude détaillée qu'il méritait, de la part de feu M. le Prof. Dr. Grubenmann, à l'Institut minéralogique et pétrographique de l'Ecole polytechnique fédérale.

Roches de sommets.

»Ce sont des roches en général granitiques et amphiboliques. Il n'y a pas de particularités minéralogiques à signaler sauf chez la roche Bii, provenant d'Holstensborg, qui présente une association de fer magnétique et de granite à oligoclase. Il serait intéressant de connaître si le fer magnétique est titané«. (M. le Prof. Dr. Mellet, à Lausanne, y a trouvé en effet un peu d'acide titanique.) (Grubenmann.)

»Les amphibolites sont des roches communes, et très fréquentes, dans les régions de contact entre les granites et les roches basiques«. (Brun.)

	Provenance.	Détermination.
A	Godthaab, au pied du Store Malene, altitude 300 m, filon dans le gneiss.	Filon d'amphibolite à amphibole verte, smaragdite.
Bi	Holstensborg, contrefort à l'W du Kjärlingshätten, près du sommet; filon I.	Amphibolite à mica noir, gros cristaux d'amphibole très dichroïque, mica noir abondant.
Bii	Même endroit, filon II.	Granite pegmatitique à oligoclase, association avec le fer magnétique (titane, Mellet).
Biii	Même endroit.	Roche très altérée par les agents atmosphériques: amphibolite à mica noir analogue à Bii, mais à cristaux plus petits. (Brun.)

M. Grubenmann a fait d'autre part les déterminations suivantes:

	Provenance.	Détermination.
C	Godthaab, sommet même du Petit-Hjortetakken, roche en place.	Aplite à pegmatite avec nodules de biotite.

D	Godthaab, sous le sommet du Petit-Hjortetakken, face W, roche gris-bleu, diaclase inclinée vers l'W.	Granite blanc à biotite; contient beaucoup de plagioclase et d'épidote; biotite brun-verdâtre à jaune.
E	Godthaab, au haut du grand couloir entre les deux Hjortetakken, in situ.	Granite blanc à biotite avec beaucoup de microcline et de microperthite. Biotite brun-verdâtre à jaune clair. Structure cataclastique. Probablement une roche alcaline.
F	Sukkertoppen, Sermilikfjord, sommet du Skifjeld.	Granite à biotite, riche en quartz, orthose; peu de plagioclase, biotite brun-jaunâtre à jaune clair, fortement cataclastique.
G	Sukkertoppen, moraine latérale gauche du Sermilikbrae, sur le glacier.	Granite aplitique rouge, presque gneissique par cataclase. Beaucoup de zircon et de plagioclase, peu de biotite limonitisée.
GII		Granite aplitique rouge avec microcline et biotite, aussi grenats rougeâtres.
GIII		Orthogneiss à biotite; structure cataclastique; peut-être provenant de GII.
HI et HII	Holstensborg, sommet de 620 m, à 6 km au NE de la colonie, chaîne du Praestefjeld.	Granite à biotite, très décomposé (deux échantillons ont été déterminés).
HIII	Même endroit.	Quartzite à séricite, parsemée de substances carboniques, beaucoup de pyrite.

(Grubenmann.)

Roches des moraines de l'inlandsis.

»Les échantillons se présentent comme des débris, partiellement roulés, de la roche; quelques-uns sont à angles encore vifs«.

A. Roches de la moraine frontale au Nùnap Kigdlingâ.

117 échantillons proviennent de la grande moraine frontale de l'inlandsis, au voisinage immédiat de la Station sur le Nùnap Kigdlingâ, par 69°43′ de latitude N, 50°6′ de longitude W Gr. et quelque 600 m d'altitude. Ils se classent comme suit:

»76 granulites et granites, 13 amphiboles, 3 syénites, 4 gneiss

schisteux, 9 épidotites granitiques, 12 roches mélanocrates, dont deux sont décrites en détail ci-dessous:

1° Gabbro foncé à labrador (extinction à 30°, symétrique) pyroxène diallage peu coloré, présentant des mâcles polysynthétiques intéressantes demandant à être étudiées de plus près. Malheureusement l'échantillon est trop petit pour cela. Il est intéressant, car il montre l'extension vers le centre du continent de roches basiques, gabbros à labradors.

2° Amphibolite, amphibole smaragdite un peu altérée«. (Brun.)

Voici maintenant les déterminations de M. Grubenmann pour ces échantillons morainiques:

»Ce sont des roches en général granitiques et amphibolitiques. Comme spécialité il y a à signaler une roche gneissique à hornblende et plagioclase, une leptite et des quartzites.

A_1 Granite à biotite (brun-vert-jaune) de couleur blanche, fortement cataclastique; avec de la magnétite, titanite, zircon, microcline, plagioclase, beaucoup de myrmekite et peu de pyrite. (8 échantillons.)

A_2 Macroscopiquement analogue à A_1, très peu lamelleuse, avec de la muscovite et de la chlorite provenant de la biotite qui se transforme aussi en épidote. Présence de titanite, orthose et beaucoup de quartz. (4 échantillons.)

A_3 Orthogneiss à amphibole et plagioclase. Structure cristalloblastique (blasto-granitique). L'amphibole (vert-bleu à jaune) est transformée en chlorite et épidote. Cette dernière existe aussi en dépôt dans les fissures. (3 échantillons.)

A_4 Aplite à pegmatite granitique. Couleurs blanche et rougeâtre. Composée de quartz et orthose; peu de muscovite (biotite altérée). Structure cataclastique. (14 échantillons.)

A_5 Aplite granitique à amphibole. (Extinction c/n_g = 23°, pléochroïsme n_g et n bleu-verdâtre, n_p jaune-verdâtre). Peu de zircon, titanite et épidote. (8 échantillons.)

A_6 Leptite. Microcristalline en grains de quartz; de l'orthose (colorée par l'hydroxyde de fer), peu de biotite (souvent chloritisée), épidote (avec de l'orthite) et pyrite. (4 échantillons.)

A_7 Granite rouge à biotite (chloritisée et épidotisée). L'orthose colorée par l'oxyde de fer et changée en séricite. Microcline et oligoclase non colorées. Trace de cataclase. (9 échantillons.)

A_8 Granite rouge à biotite (brun-rougeâtre à jaune). Beaucoup de plagioclase, peu de zircon. Traces de cataclase. (9 échantillons.)

A_9 Granite aplitique rougeâtre. Peu de biotite chloritisée et épidotisée; beaucoup de microcline. Structure aplitique. (2 échantillons.)

A_{10} Quartzites granuleuses et blanches (8 échantillons).

A_{11} Quartzites jaunâtres et des morceaux indéterminables (5 échantillons).

A_{12} Gabbro (Ophite?) à grain fin. Plagioclase très fraîche de couleur brunâtre; les pyroxènes monocliniques chloritisées à la périphérie. (4 échantillons.)

A_{13} Roche amphibolitique (analogue à B_1 et B_2 de l'îlot morainique). Les plagioclases fraîches avec plus ou moins de magnétite. En outre ilménite avec leucoxène. (8 échantillons.)

A_{14} Orthogneiss à biotite (brun-verdâtre à jaune), riche en quartz avec des veines aplitiques. La magnétite entourée de titanite (probablement un gneiss d'injection). (5 échantillons.)

A_{15} Epidotite et schistes épidotiques. Structure poëciloblastique. L'albite renferme des cristaux d'épidote. Les autres échantillons paraissent être de saussurite. Les roches semblent issues d'une roche ophitique ou amphibolitique; d'autres morceaux représentent peut-être des veines épidotiques dans un granite rouge. (8 échantillons.)

A_{16} Roche épidotique en contact avec une roche amphibolitique (1 échantillon)

A_{17a}, A_{17b} Roche amphibolitique à biotite et plagioclase. L'amphibole analogue à celle de B_1 (îlot morainique); $c/n_g = 28°$, pléochroisme n_g et n_m vert foncé, n_p jaune-verdâtre. Plagioclase saussuritisée. Roche schisteuse. (7 échantillons.)

A_{18} Granite rouge à amphibole. L'orthose séricitisée, la plagioclase épidotisée. (4 échantillons.)

A_{19} Schiste à actinote. Contient des cristaux de magnétite. (1 échantillon.)« (Grubenmann.)

B. Roches de l'îlot morainique de l'Ekip Sermiâ.

»Cette station (latitude N 69°52′, longitude W Gr. 49°56′, altitude 500 m) a donné 55 échantillons se répartissant ainsi: 1 quartz, 9 syénites plus ou moins riches en amphibole, 21 granites, 2 épidotites, 8 cornéennes, 9 schistes et schistes sédimentaires, 5 roches mélanocrates: gabbros, ophites....

Trois échantillons ont été examinés en détail: ce sont des diabases ophitiques à larges cristaux de pyroxène titanifère pénétrés de labrador, avec du fer magnétique rare. Ces diabases sont des plus intéressantes, car elles présentent des relations évidentes avec les diabases ophitiques du Spitzberg; c'est le même genre de pyroxène titanifère et le même mode de cristallisation du fer magnétique: les labradors semblent être les mêmes. Il y a évidemment extension des roches basiques assez loin dans l'intérieur du continent. Si nous n'avons pas dans la moraine de vrais basaltes, nous avons des ophites à labrador et des gabbros qui sont très typiques«. (Brun.)

Voici maintenant les déterminations de M. Grubenmann pour cet ensemble de roches:

»B. Ce sont en général des roches granitiques et amphibolitiques. Comme particularités: une roche ophitique, un schiste à biotite et un schiste à biotite et à épidote.

B_1 Ortho-Amphibolite. Amphibole commune en lambeaux et fortement perforée. La plagioclase saussuritisée, la titanite et l'épidote en veines. (2 échantillons.)

B_2 Ophite (porphyritique en traces). Contient une pyroxène monoclinique (brun pâle, altéré et un peu chloritisée). Biotite (brun-verdâtre à jaune) entourant la magnétite. Plagioclase très fraîche de couleur brunâtre. (1 échantillon.)

B_3 Schiste à biotite (brun à jaune), contient quartz et carbonate en grains; peu d'épidote. (2 échantillons).

B_4 Quartzite à biotite et à séricite en grains de grandeur microscopique, un peu schisteuse. (2 échantillons.)

B_5 Quartzite riche en biotite, schisteuse (1 échantillon).

B_6 Granite rouge à biotite chloritisée et épidotisée; beaucoup de plagioclase, peu de microcline et titanite; orthite rare. Un peu cataclastique. (7 échantillons.)

B_7 Granite rouge à biotite. Analogue à B_6, mais plus cataclastique et moins riche en plagioclase. (2 échantillons.)

B_8 Granite aplitique rouge; l'orthose colorée par l'oxyde de fer. Beaucoup de titanite et de microcline. Peu de biotite (vert-olive à jaune), zircon. (5 échantillons.)

B_9 Granite blanc à biotite (granodiorite?). Plagioclases zônées, épidotisées et séricitisées. Quartz à extinction onduleuse. Biotite (vert-olive foncé à jaune clair) en crible. (6 échantillons.)

B_{10} Roche amphibolitique avec plagioclase saussuritisée. L'amphibole donne: $c/n_g = 23°$, n_g bleu-verdâtre, n_m vert foncé, n_p jaune. (2 échantillons.)

B_{11} Schiste à épidote et chlorite avec grains de quartz et albite (2 échantillons).

B_{12} Roche amphibolitique à albite. L'amphibole: $c/n_g = 14°$; n_g bleu-verdâtre, n_m jaune foncé, n_p jaune pâle. (2 échantillons.)

B_{13} Federamphibolit (Hornblendegarbenschiefer). La hornblende: $c/n_g = 13°$, n_g bleu-verdâtre, n_m jaune, n_p vert-olive, est enfoncée dans un tissu de quartz granuleux. (1 échantillon.)

B_{14} Saussurite (1 échantillon).

B_{15} Schiste à chlorite avec des grains de quartz (3 échantillons).

B_{16} Gneiss granitique à biotite (3 échantillons).

B_{17} Quartzite (1 échantillon).

B_{18} 9 échantillons indéterminables.

Il n'a pas été fait de coupes minces pour les roches B_{14}—B_{18}«.
(Grubenmann.)

C. Roches de la moriaine frontale de l'inlandsis.

A la côte orientale, campement No. 29 (Echantillons de Quervain).

1° Gneiss d'injection à biotite.

2° Roche amphibolitique avec une veine blanche à quartz et albite. (Grubenmann.)

De l'examen de cet ensemble de roches M. Grubenmann tire les conclusions suivantes (selon traduction textuelle):

»Les spécimens de roches récoltés dans la moraine de l'inlandsis indiquent que les glaces recouvrent un massif granitique étendu, dont les granites à biotite, blancs et rouges, avec peut-être encore de la hornblende, constituent la masse principale; de nombreuses aplites rouges et des pegmatites y représentent l'accompagnement filonien. Les granites montrent souvent des traces distinctes de cataclase, et les gneiss granitiques à biotite de même que les schistes à biotite n'en sont pas exempts non plus. Ceci signifie que certains massifs granitiques et gneissiques se sont trouvés soumis postérieurement encore à des actions tectoniques, avec lesquelles les injections aplitiques ainsi qu'une formation de gneiss d'injection ont été de pair.

Comme il arrive parfois, à côté des masses acides, rouges et blanches, allant du granite à la syénite et en relation plus ou moins intime avec elles, il se présente ici aussi des faciès gabbroïdes, savoir: pour une part des gabbros à grain fin proprement dits et des gabbros à saussurite, et pour l'autre part des diabases d'intrusion et leurs dérivés métamorphiques tels que les diverses amphibolites et les schistes chloriteux à épidote. Les schistes à actinote et les schistes chloriteux qui apparaissent à leur côté doivent être mis de préference en relation avec des roches péridotiques, qui d'habitude revêtent comme d'un manteau un noyau gabbroïde, au quel cas on doit s'attendre à rencontrer aussi des serpentines. De fait il est très remarquable que les matériaux qui m'ont été soumis[1]) n'en renferment aucune.

Les quartzites à séricite, les quartzites proprement dites et les schistes à épidote proviennent dans la règle de roches psammitiques, voire argilocalcaires et résultent soit d'une pression orogénique unilatérale, soit de métamorphisme de contact; on peut attribuer l'aplite à grenats à ce dernier processus.

Toutes les roches magmatiques étudiées semblent appartenir aux

[1]) Tous les matériaux récoltés, sans exception. (P.- L. M.)

roches alcalino-calcaires et il est dans une certaine mesure surprenant qu'on n'ait recueilli aucun échantillon de roches faiblement ou faiblement alcalines, dont cependant quelques explorateurs danois ont signalé la présence au Grœnland«. (Grubenmann.)

Contribution à la météorologie et climatologie de la côte occidentale du Groenland.

sur la base des observations de A. de Quervain, W. Jost et A. Stolberg.

1. Remarques sur les observations de nuages à la traversée de l'océan.

Les observations météorologiques régulières étant faites sur les navires danois et aux stations de la côte du Grönland, je me borne à quelques observations particulières. Nous avons été frappés combien les apparitions de »halo« et des phénomènes optiques plus compliqués étaient fréquents en comparaison de ce qu'on voit en Europe centrale. De même, il était frappant de voir avec quelle rapidité le mauvais temps s'approche, si on compare avec les conditions continentales. De même il était intéressant de constater la correspondance étroite entre la marche du barographe et le caractère du temps. Pour peu que le baromètre montât, il y avait tout de suite une tendance à nuages cumuliformes et à éclaircies. — Ces formes de cumulus n'étaient jamais importantes sur l'océan, mais bien dans le détroit de Davis. La longue durée de couches de nimbus sans précipitation notable nous a étonnés. Quant aux nuages du niveau moyen, nous avons l'impression, que les alto-cumulus n'étaient pas hauts et se rapprochaient plutôt du niveau des strato-cumulus; plusieurs fois nous avons constaté la tendance à la formation de cumulo-stratus, et des alto-cumulus en ondes, stationnaires, semblables à des formes lenticulaires. Ça se voyait sur la terre au départ et plus tard sur l'océan, à l'approche des dépressions. Dans un cas particulier, ces formes out persisté pendant une montée seulement passagère du baromètre.

Sur l'océan je n'ai jamais pu constater une formation de cirrus provenant de cumulo-nimbus qui expliquerait le voile de cirrus dépressionnaire. La possibilité d'observer la naissance de ces couches ne s'offrit pas. Il n'y avait donc pas l'occasion de trancher la question de l'origine de ces cirrus, que les Norvègiens expliquent par leur théorie des plans de discontinuité très inclinés, alors que nous continuons à admettre pour bien des cas, la formation par cumulo-nimbus, qui semble être prouvée maintenant pour certaines dépressions de la Méditerranée.

Par contre, on a pu constater le 14 avril, dans le détroit de Davis un nuage de grain, qui possédait un voile de cirro-stratus; les deux

enclumes étaient bien visibles. Sur la terre, il y avait de grandes masses de cumulus.

2. La difference de température à la côte et dans les fjords au printemps.

Dans la première moitié de mai nous avons fait des mesures comparatives entre Holstensborg et l'intérieur du fjord, 65 km plus à l'est (mesures exécutées par MM. Gaule, Jost et Stolberg). L'intérieur du fjord a été trouvé déjà plus chaud de 2° en général par temps troublé; cette différence peut monter à 4° ou 5°; dans une nuit tout à fait claire, le fjord était plus froid de $^1/_2$°.

3. La différence du climat du bord de l'inlandsis et de la côte en été.

Nous avons déjà relevé, en discutant les résultats de la traversée de l'inlandsis, le climat extraordinaire de la zone voisine du bord de l'inlandsis.

Les observations faites par le groupe de l'ouest (par MM. Jost et Stolberg) au bord de l'inlandsis et à Quervainshavn (entre le 21 juin et le 19 août) permettent une comparaison très instructive à ce point de vue avec la station danoise de Jakobshavn, située à 65 km de distance au SW, sur la côte. Un séjour de 2 semaines à Jakobshavn, a permis en outre des observations de contrôle qui donnent toute leur valeur à la comparaison des deux stations.

Différence de température entre la bord de l'inlandsis et Jakobshavn.

Notre Station se trouvait, du 23 juin au 30 juillet, à 530 m de hauteur et à 600 m du bord de l'inlandsis, dans les rochers (voir carte No. 3 de la planche 2). Pendant ce temps le minimum moyen a été de 2,4°, le minimum absolu de 0°, la température à 8^h de 5,8°, à 2^h p de 7,8°, le maximum moyen 11,1° (maximum absolu 15,2°) et la température à 9^h du soir 5,3°. Pendant la même époque, le minimum de Jakobshavn a été plus élevé de 2,7°, les températures des 3 termes horaires plus élevées successivement de 1,8°, 1,1° et 2,2°. Ces différences seraient diminuées de $^1/_2$ à 1°, si on avait employé à Jakobshavn un thermomètre à aspiration, comme c'était le cas à notre station. On sera étonné de constater cette petite différence, surtout si on tient compte de la différence d'altitude de 530 m. On en conclut, combien la région rocheuse un peu plus distante de l'inlandsis doit être favorisée. Par contre on trouve comme différence entre Jakobshavn et toutes les températures mesurées sur le bord de l'inlandsis lui-même, une différence moyenne de 5,9°, et pour les cas où Jakobshavn a eu un vent du SE (föhn), même une différence de 8,6°. Il est très inattendu de voir que les 600 m de

terrain rocheux situés entre le bord de l'inlandsis et la Station, peuvent amener une différence de température de 5°, alors que le tout est ventilé par le même courant d'air énergique.

Quand au vent, son intensité mesurée au bord de l'inlandsis est double de celle de Jakobshavn.

La comparaison des directions amène à la constatation illustrée par la figure: Le vent du SE domine de beaucoup à Jakobshavn dans toutes les saisons, sauf l'été, où il est réduit, à cette station, seulement à un minimum secondaire, alors que le vent d'ouest y domine. Mais ce vent du SE repoussé à Jakobshavn continue à souffler en arrière de la côte, où il domine absolument la situation. Cela amène au schéma de la figure qui indique une sorte de mousson, comme vent des basses couches, alors que dans les hauteurs le SE persiste (en ceci notre schéma diffère de celui de Mr. Engell, que nous ne connaissions pas alors).

La nébulosité montre une différence en faveur du bord de l'inlandsis, comme fait voir ce petit tableau.

		8^h a	2^h p	9^h p
Nébulosité en juin	Bord de l'inlandsis.....	5,0	5,8	6,5
	Côte (Jakobshavn).....	7,1	6,7	6,9

Remarque sur les différences de température et de vent entre Quervainshavn et Jakobshavn.

Un séjour de 15 jours de l'escouade occidentale pendant la première moitié d'août, a permis de constater que les températures de ce point situé au niveau de la mer, concordent en moyenne avec Jakobshavn; mais Quervainshavn est plus chaud de 4 à 5°, quand il a déjà le vent du SE ou du S, alors que Jakobshavn a encore le courant venant de la mer. Il se présente aussi la situation inverse, qui retourne le sens de la différence thermique.

4. Résumé des observations météorologiques de Godhavn, d'octobre 1912 à juin 1913 et comparaison avec Jakobshavn.

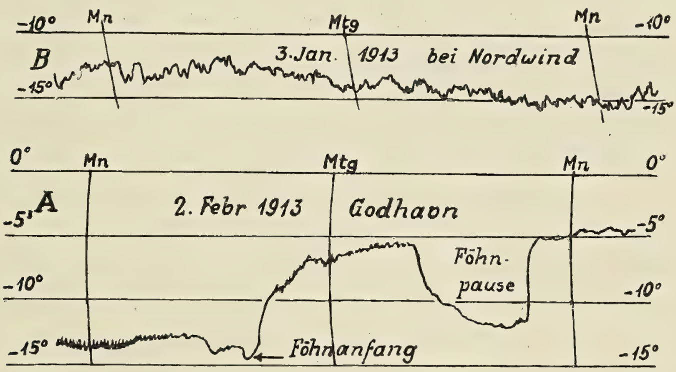
(Ce résumé des observations exécutées par le Dr. Jost et Dr. Stolberg peut intéresser au point de vue de la station biologique, où elles ont été faites, surtout pour des comparaisons avec Jakobshavn, dont on possède une longue série.)

La température est plus chaude, d'octobre jusqu'an avril, de $1^1/_2$ à 3°; cette différence apparaît aussi dans les températures extrêmes; cela paraît dépendre de la formation sur la mer de la glace (qui s'étend de 1 à 2 km au commencement de novembre). La mer gèle bien plus vite sur la côte de Jakobshavn qu'au sud de Disco. Cette explication concorde avec le fait que les plus grandes différences s'observent avant

le Nouvel-An. En mai et en juin la situation est inverse; Jakobshavn est plus chaud de 1° que Godhavn, qui est exposé aux vents d'ouest froids, qui viennent de la mer.

Le nombre des jours avec précipitation est le même aux 2 stations, mais la quantité est double à Godhavn, ce qui est intéressant au point de vue de la hauteur de la limite de la neige.

Pour la nébulosité il y a une différence de 10 à 21 $^0/_0$ en faveur de Jakobshavn. Le mois de mars on ne trouve pas cette différence, qui est supprimée par la fréquence plus grande du brouillard à Jakobs-



Particularités de l'allure de la température, Godhavn.

havn, (un brouillard qui du reste ne couvre presque jamais le ciel). L'intensité du vent paraît être de 25 à 30 $^0/_0$ moins forte à Godhavn. Concernant la direction du vent à Godhavn, le vent du nord prédomine au commencement de l'hiver; vers février le maximum commence à se déplacer vers le SE et l'E, où il se maintient en mai et en juin, alors qu'un second maximum tombe l'NW. En même temps Jakobshavn a d'abord un maximum à l'E, qui se répartit à partir de janvier entre sur le l'E et l'W et tourne jusqu'en avril et mai vers le S et en même temps un maximum secondaire entre l'W et le NW se développe de plus en plus.

On voit donc aux 2 stations que les vents avec composante E tournent à droite et faiblisent à mesure que la saison avance, alors que les vents venant de la mer et dirigés vers la côte augmentent. La première constatation correspondrait au fait que l'influence de la circulation en faveur du gradient déterminé par l'inlandsis, ce gradient est dirigé plutôt vers le sud en hiver, plutôt vers l'est en été.

La seconde constatation correspond au phénomène d'une mousson d'été.

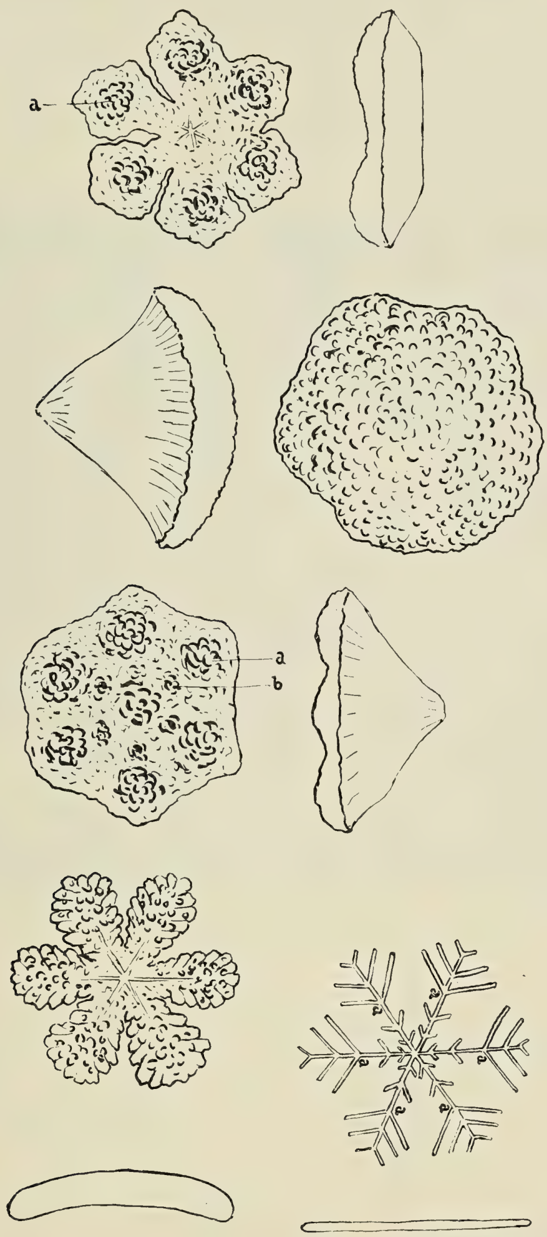
D'autres remarques sur les vents particuliers de Godhavn se trouvent dans la discussion des ascensions des ballons-pilotes et dans le petit exposé de Mr. Jost, qui va suivre et dans lequel la particularité de Godhavn

est caractérisée. D'après lui il faut distinguer 2 sortes de vent qui ont un caractère de föhn. Le premier est le vent de NE, qui se produit par baisse barométrique comme vent violent de ENE ou NE accompagné par des hausses subites de température. L'air est relativement sec, le ciel est couvert de cirro-stratus minces mais étendus. Quand aux montées de température, elles peuvent être de 8 à 15°, nous reproduisons par la figure ci-jointe un diagramme thermométrique qui caractérise très bien ces brusques montées de température, avec leurs interruptions passagères. Si février s'est distingué surtout par ces périodes de föhn, mars, avril et mai n'en ont plus eu. Les vents d'ouest qu'on observe pendant ces temps sont assez fréquents, mais ils ont un autre caractère, ils sont faibles, s'observent surtout le matin et n'influencent guère la température et l'humidité. En hiver presque chaque chûte un peu forte du baromètre est accompagnée d'un föhn, alors qu'à partir de mars et jusqu'en juin ce n'est plus le cas. On peut avoir au printemps quelquefois une pression très basse et un fort vent d'est, accompagné de températures basses et de beaucoup d'humidité.

Une comparaison des observations faites à Jakobshavn avec les nôtres faites à Godhavn montre que jamais on n'observe à Godhavn le föhn venant de l'est, sans qu'il y ait en même temps un föhn à Jakobshavn, et vice-versa. On peut donc dire que c'est la circulation de l'inlandsis qui se fait sentir encore à une distance de plus de 100 km du bord de l'inlandsis et y constitue un facteur important du climat. Ce sont ces vents qui détruisent la glace sur la mer et l'enlèvent, ce sont eux qui font qu'à Godhavn on a pour ce mois une variation mensuelle de température de 26 à 28°, c'est ce vent aussi, qui »mange« la neige avec une rapidité étonnante.

Les ballons-pilotes ont prouvé que le vent de NE, qui s'étend jusqu'à 1000 et 1800 m est dûe à une influence de déflexion des hautes parois de la côte méridionale de l'île. C'est une zone très tourbillante; plus haut on a la direction de ESE, qui tourne toujours plus à droite, quelquefois jusqu'au S. C'est le grand courant que nous connaisons par les mesures faites à la côte.

Les vents du nord avec caractère de föhn ou de bora. Ils s'observent quand la pression monte ou par situation de haute pression. Quand ils arrivent, la température se maintient ou baisse même de quelques degrés. An thermographe elle montre des oscillations très caractéristiques de 1 à 2°, l'humidité relative est faible et descend quelquefois jusqu'à 20 %. Le ciel s'éclaircit en général. Sur la mer au sud, il neige quelquefois, les parties les plus élevées des montagnes sont quelquefois entourées de brouillard. Ce vent n'est pas fort, mais très irrégulier, formant des tourbillons tantôt d'un côté, tantôt de l'autre; sa direction varie à la Station arctique entre NNE et NNW.



Godhavn 1912. Jost.

Formes de transition de la neige au grésil.

Sa fréquence augmente jusque vers le Nouvel-An, pour décroître ensuite. En avril et en mai il est rare, en juin il n'a plus été observé.

Les ballons-pilotes ont montré qu'alors qu'il y a au sol ces vents faibles du nord, on trouve au-dessus une couche s'étendant à 1000 ou 1500 m, exceptionnellement même à 2000 m, qui possède des directions et des forces de vent très variables, avec des sauts très brusques. Au-dessus de cette couche, le vent tourne en général plus régulièrement

Grésil en secteurs sphèriques (grossis. env. 2 fois).
Phot. Jost. Disco 1912 XI.

à gauche, en passant par NW W SW et même S, ce qui fait penser à un minimum étendu à l'ouest. Les observations de Jakobshavn ne montrent rien de particulier pour cette période. A la côte de Disco même on observe que l'influence de ce vent, ne s'étend souvent qu'à quelques mètres de la côte.

Le vent d'ouest à caractère de brise de mer. Ce vent se fait sentir à partir de la seconde moitié de mai, comme vent du nord, alors que le matin on a plutôt des vents d'est, entre le matin et le soir, le vent tourne avec une grande régularité avec le soleil. Ce vent apporte toujours un air froid et humide, qui fait descendre précipitamment la température de l'air à partir de 8^h du soir. Dans le cas du 4 juin, dont le thermogramme est réproduit dans notre figure, la chûte de tempéra-

ture est de 8°, en même temps, l'humidite relative monte, il n'est pas rare que des brouillards se forment. Ce vent d'ouest est sans doute dû au contraste entre les rochers sombres de basalte de la côte, qui se chauffent beaucoup et la mer qui reste très froide.

J'attire encore l'attention à l'occasion de ce résumé des observations faites par le Dr. Stolberg et Jost, sur les observations de ce dernier, concernant la formation des grains de grésil, à forme de secteur sphérique. Il a trouvé toutes les transitions entre cette forme et les flocons de neige hexagonaux.

Cinquième Section.

Recherches sur la Circulation de la haute Atmosphère à la côte occidentale du Groenland par la méthode des ballons-pilotes,

en mai 1912 et hiver 1912/13. (Mesures exécutées par le Dr. W. Jost et le Dr. A. Stolberg, discutées par W. Jost et A. de Quervain).

Remarques liminaires.

Avec le Dr. A. Stolberg et le Dr. E. Bäbler, j'avais fait en 1909 une première série de sondages par ballons-pilotes sur la côte occidentale du Grœnland. Les résultats de cette série de 60 ascensions étaient tellement remarquables qu'il me paraissait désirable de les compléter par une série d'hiver proprement dite. Ce désir pouvait être réalisé dans le programme de l'Expédition suisse au Grœnland, par l'hivernage de deux membres, le Dr. Stolberg et le Dr. Jost à Godhavn à la latitude de 69°, de 1912 à 1913. Ainsi j'ai pu appliquer ou faire appliquer à un problème de circulation générale la méthode des ballons-pilotes que j'avais élaborée le premier en 1905 et 1906, et que j'ai eu la satisfaction de voir employée généralement, après qu'elle ait été reçue avec des doutes et des critiques précisément par ceux qui plus tard auraient désiré d'en faire la leur.

Nous avons employé l'équipement ordinaire: un théodolite spécial de ma construction et une balance pour mesurer la force ascensionnelle.

Nous avons employé des ballons-pilotes de la maison Tre-Ugolnik de St. Petersbourg. On leur donnait en général une force ascensionnelle de 200 gr pour laquelle on admettait une vitesse verticale de 200 m par minute; ceci sur la base des mesures fondamentales que j'ai exécutées en 1907 à la cathédrale de Zurich.

L'hydrogène comprimé a été mis à notre disposition par l'entreprise Zeppelin à Friedrichshafen.

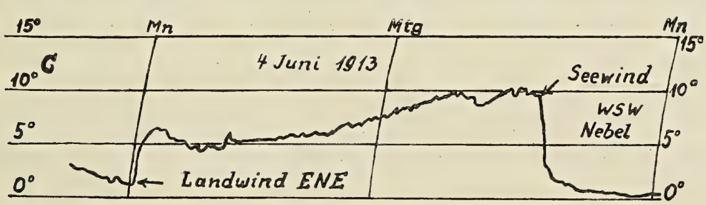
Les visées ont d'abord été exécutées par A. de Quervain et ensuite essentiellement par le Dr. A. Stolberg et le Dr. W. Jost. Souvent cette besogne a été rendue très pénible, en été surtout par les terribles moustiques, en hiver par le vent violent.

La hauteur moyenne atteinte a été de 6000 m. Si on élimine les cas où le ballon a disparu dans les nuages, cette moyenne monte à

Lâcher de ballon-pilote, Godhavn. Au fond la paroi de basalte, orientée vers le sud et haute de 1000 m environ.

Printemps 1913.

8000 m; la bonne qualité des ballons et non moins la transparence extraordinaire de l'air polaire ont contribué à ce résultat extraordinaire. La plus grande durée d'une visée a été de 3 heures 15 minutes et l'altitude correspondante 39000 m (?). (Cette altitude maxima n'est pas à l'abri d'un certain doute). La distance horizontale où les ballons sont devenus invisibles a été en moyenne de 25 km. Nous avons atteint des distances maxima de 42 et 37 km. Le ballon monté à 39 km aurait eu une distance maxima de 132 km. Les ascensions de ballons-pilotes ont été accompagnées d'observations météorologiques qui ont servi à la discussion. Je ne voudrais pas terminer ces remarques sans mentionner



La côte sud de Disco escarpée et qui dévie le foehn continental du SE.
Phot. Jost 1913.

le grand mérite du magister M. P. Porsild, directeur de la Station arctique danoise à Godhavn, qui a abrité mes compagnons et les a soutenus de son mieux.

Les tableaux ont été calculés par Jost; l'interprétation des résultats est notre travail commun; la rédaction qu'on trouve ici et les conclusions générales proviennent de A. de Quervain. Les ascensions ont été publiées en détail pour des différences de hauteur de 500 à 500 m dans le volume 53 des Mémoires de la Société Helvétique des Sciences Naturelles.

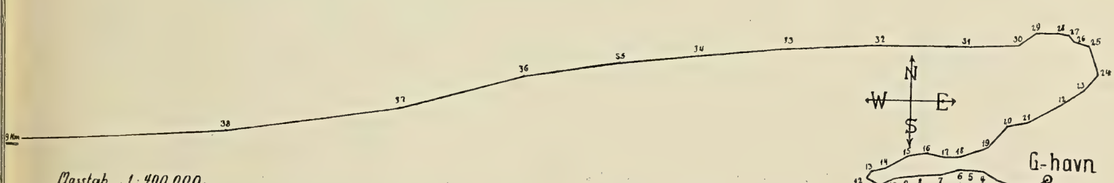
Nous donnerons ici un résumé des résultats généraux:

I. Nombre des mesures et vitesse moyennes aux différents niveaux.

Le nombre des ascensions à Godhavn est 5 fois plus grand que celui de Holstensborg; ces dernières mesures répètent du reste et confirment en général les observations que nous avions faites déjà en 1909 dans ces régions. Nous appuierons donc cette fois davantage sur les mesures de Godhavn. A Holstensborg nous trouvons en mai 1912 une augmentation de la vitesse avec la hauteur de 2 m par km; de 8—9 km une décroissance de la vitesse semble se faire sentir. A Godhavn (hiver 1912—13) la vitesse absolue est plus petite, de même son augmentation avec la hauteur n'est que de environ 1,3 m par km. Cette augmentation continue jusque vers 8 km, et plus haut une décroissance des vitesses se constate avec certitude jusqu'à 10500 m de hauteur. Il est plausible de mettre en relation l'altitude du maximum de vitesse avec la séparation de la troposphère et de la stratosphère. L'altitude de 8—9 km que nous avons trouvée concorde bien.

Pour juger du vrai transport des masses d'air, il faut tenir compte de la densité décroissante. Ainsi on trouve que pour Holstensborg le transport de l'air s'est doublé à peu près à partir du sol jusqu'à 4 km. De là, ce transport reste pratiquement constant jusque vers 10 km, avec un maximum peu exprimé vers 6 km.

Pour Godhavn, le transport est le même depuis le sol jusque vers 6 km (5 m par seconde) densité normale, avec un maximum insignifiant vers 6 km; puis ce transport décroit et vers 10 km il n'est plus que de 3 m »normaux« par seconde. Ce sont là des constatations remarquables: Plus au nord, et en hiver, la circulation est bien moins intense que plus au sud et au commencement de l'été!



Projection horizontale du trajet du ballon-pilote du 25 II 1913, à Godhavn (39 km d'altitude).

II. Fréquences des diverses directions de 10 en 10° et vitesses correspondantes moyennes.

Si l'on fait tout d'abord abstraction des différents niveaux, on trouve un maximum entre l'est et le sud. Pour Holstensborg le maximum de la fréquence tombe très nettement sur S 40°E, avec une moyenne quadruple; pour Godhavn le maximum se répartit plutôt sur une zone allant de E 30°S vers S 20°W. Dans cette zone, le maximum absolu tombe sur le sud.

On remarque encore 2 maxima secondaires, l'un à E 20°N qui dépend probablement des conditions locales de la côte sud de Disko. Un maximum secondaire se trouve vers N 30°W.

En général, les directions qui les plus fréquentes sont aussi les plus fortes.

III. Fréquence et force des courants aux différentes hauteurs.

(Voir les deux figures).

Ces discussions tiennent compte, pour plus d'homogénéité, seulement de la série de Godhavn. On distingue les altitudes de 1, 2, 4, 6, 8, 10 km et seize directions. Nous examinons d'abord la figure qui se rapporte à la fréquence en pour-cent. A 1 km de hauteur, il existe un maximum prononcé d'est, un maximum secondaire pour NW. A 2 km, le maximum principal se maintient, mais dévie vers SE, le maximum secondaire vers N-NW. A 4 km, le maximum a tourné davantage vers la droite et se trouve au S; à 6 km, il dépasse encore un peu le S. Vers 8 km il se retrouve à S, et vers 10 km, oû les cas sont déjà rares, il est en général à S jusqu'à S-SE. Le minimum se trouve dans toutes les altitudes à W jusqu'à WNW et N. Si on répète la même discussion, la discussion pour la figure, où il est tenu compte des vitesses du vent, on retrouve les mêmes faits et d'une façon encore plus prononcée. Ainsi les conditions hivernales de la circulation à l'ouest du continent groenlandais sont caractérisées d'une façon nette et typique.

IV.

La discussion précédente est complétée utilement par un calcul des résultantes. A Holstensborg la résultante de la couche voisine du sol est de E-SE; elle tourne au SSE jusqu'à 2 km, revient vers SE jusqu'à 3,5 km, revient vers SSE jusqu'à 7000 m et tourne vers SSW de 8000 jusqu'à 9000 m. Ce dernier virement paraît correspondre à la stratosphère.

Les résultantes trouvées pour Godhavn confirment le résultat de la discussion trouvé plus haut; elles montrent que les maxima déjà constatés sont tout à fait décisifs pour les résultantes. Le maximum

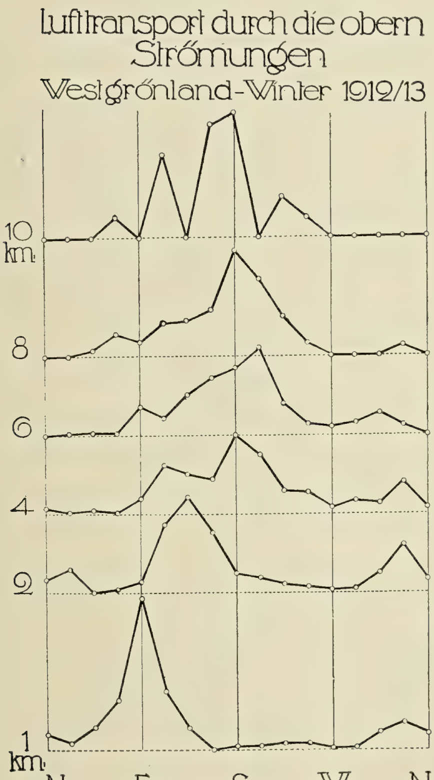
de la couche la plus basse se trouve ici vers ENE. Une direction générale du sud avec petite composante est se trouve jusque vers 4000 m. De là jusqu'à 7000 m il y a une résultante sud avec petite composante ouest; ensuite, il y a ESE à SE jusqu'aux plus grandes altitudes. Ces directions des vitesses résultantes seront intéressantes pour des recherches et représentations générales.

Il sera question des conditions locales de vent de la station de Godhavn à un autre endroit.

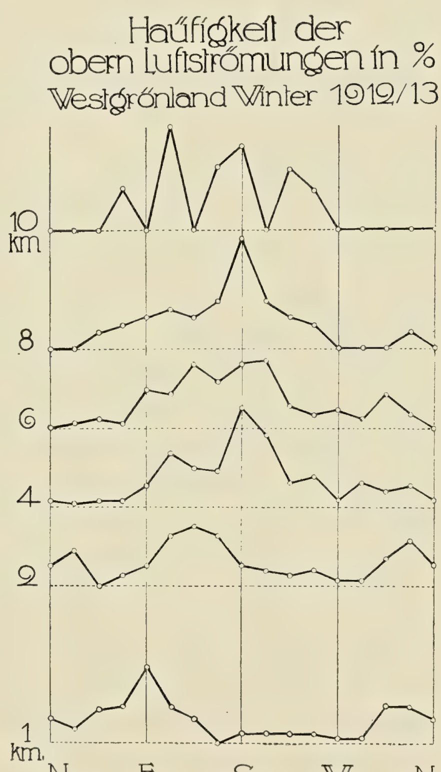
Les tableaux dont nous venons de caractériser les résultats ont été publiés in extenso dans les Mémoires précités.

Relations entre les courants supérieurs et la répartition de la pression.

Grâce aux cartes d'isobares établies par l'Institut Météorologique Danois et qui paraîssent reposer sur un nombre suffisant de points d'appui, nous avons tenté cette discussion. Nous procéderons en suivant la direction du vent et en mentionnent quelques cas typiques.



Transport d'air par les courants supérieurs. Grönland W. Hiver 1912—13.



Fréquence relative des courants supérieurs Grönland W. Hiver 1912—13.

Le vent du nord existe à peine, sauf comme vent local au sud de Disco, mais sans jouer aucun rôle dans la haute circulation.

Le vent du nord-ouest ne joue pas un rôle important, mais il existe en quelques cas typiques, où un minimum barométrique se trouve entre la côte est du Groenland et l'Islande. (Voir plus loin la carte du 4 septembre 1912 et du 16 avril 1913) et un certain nombre d'autres cas qui ont été observés en automne et au printemps, mais pas en hiver. Dans certains cas il paraît dépendre d'un rien si c'est un minimum situé à l'est ou à l'ouest et dont l'influence est décisive.

Le vent d'ouest s'observe à peine; on le constate éventuellement comme vent faible á l'arrière de dépressions qui passent le détroit de Davis en allant vers le nord.

Le vent du sud-ouest est rare; dans des couches inférieures il se trouve en arrière d'une dépression comme dans le cas précédent. (Ce vent du sud-ouest correspond alors au vent du nord-ouest en Europe centrale.) Dans les couches plus élevées, le vent du sud-ouest se trouve comme virement extrême vers la droite des vents plus inférieurs et du sud-est.

Le vent du sud est très fréquent, et avec le sud-est, la direction la plus fréquente dans les hautes altitudes, quand il y a des dépressions sur le sud du détroit de Davis et sur la Terre de Baffin. (Voir la carte du cas typique du 3 novembre 1912).

Le vent du sud-est est le plus fréquent dans les hautes couches quand il y a des dépressions à l'ouest. On est frappé de voir avec quelle constance, sans virer à droite, cette direction continue quelquefois. Voir la carte ci-jointe du 4 octobre 1912).

Le vent d'est ne joue qu'un rôle local comme direction transitoire du vent du nord-est, caractérisant les couches inférieures de Disco, au vent supérieur du sud-est.

Le vent du nord-est se trouve dans la situation qu'on vient de citer jusque vers 1000 ou 1500 m, mais il existe aussi s'étendant très haut quand un maximum barométrique intense se trouve sur l'inlandsis, mais déplacé vers l'ouest. En ces cas, il y a souvent des dépressions en même temps sur le détroit de Davis et au sud-est du Groenland.

Relation avec la répartition de la pression moyenne.

Ainsi qu'on a discuté ailleurs les ascensions particulières en relation avec leur situation synoptique (voir Mémoires S. H. S. N.), il faut rattacher les conditions moyennes des courants d'air aux cartes de pression moyenne. On savait déjà qu'il existait sur le détroit de Davis une sorte de minimum stationnaire qui est en relation avec le centre d'action islandais et forme quelquefois le minimum principal. Nos ascensions de 1909 ont confirmé ce fait d'une façon presque inattendue. La ré-

partition mensuelle de la pression au-dessus de la région qui nous intéresse a été déduite pour une époque de 25 ans par Mr. Defant sur la base des cartes de Hoffmeyer. Le petit tableau suivant caractérisera suffisamment les pressions moyennes des trois centres d'action qui nous intéressent. On déduit de ces cartes que le minimum du détroit de Davis n'est plus guère indépendant en février, mars et avril, alors que en juin et en juillet il devient le centre principal, et égale presque le centre islandais en août et octobre.

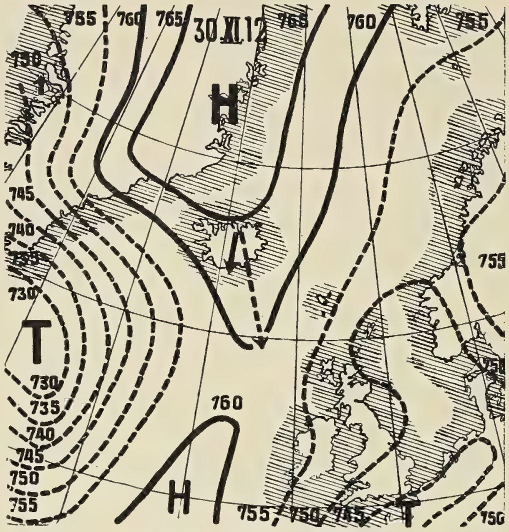
En présence de la grande variabilité de la répartition de la pression dans ces régions, j'avais cru nécessaire de ne pas me baser sur ces pressions moyennes, mais de déduire des cartes pour les mois de l'année même qui nous intéressaient. Les cartes manuscrites qui avaient été mises à notre disposition par l'Institut danois, contenaient trois stations très précieuses qui ordinairement n'existent pas; c'étaient Northstar-Bay au cap York (position 76°30′ N, 68°55′ W), Borg (quartier d'hiver de l'expédition Koch-Wegener, 77°05′ N, 23° W) et enfin une station du Spitsberg (Isfjord). J'ai ainsi pu fixer l'anticyclone de l'inlandsis grœnlandais d'une façon beaucoup plus sûre.

La comparaison de ces moyennes mensuelles 1912—13 avec les moyennes de 25 ans nous apprend le fait surprenant que pendant nos mesures le gradient barométrique qui va du maximum grœnlandais au minimum islandais et au minimum du détroit de Davis, a le double de sa valeur moyenne, et ceci pas seulement dans un mois particulier, mais dans la moyenne des 4 mois d'hiver. Le renforcement de ce gradient de 10—20 mm ne provient qu'en petite partie de l'existence de la station Borg, mais essentiellement du creusement extraordinaire du minimum d'Islande.

Février dévie en ce sens du type moyen que le minimum se trouve essentiellement sur le détroit de Davis, ce qui en moyenne est seulement un cas d'été. En général, le minimum du détroit de Davis paraît plus prononcé pendant l'hiver 1912—13 et s'étendre davantage vers le nord dans la direction de la Baie de Baffin. D'après les cartes moyennes de Defant les isobares d'hiver ont eu dans la région des ascensions la direction S 45°E. D'après nos cartes de l'hiver 1912—13, la direction se rapproche davantage du méridien. Elle est environ S 30° E, avec un gradient qui augmente vers E 30° N et semble avoir une valeur de 1,5—2 mm (voir la figure de nos cartes).

On ne s'étonne pas d'avoir constaté des vents du sud-est dans les couches inférieures de l'atmosphère libre. Cette constatation est sans doute importante parce que les conditions du terrain ne permettaient pas de la faire avec la mesure ordinaire du vent. Mais ce qui est surtout important, c'est la constatation que les courants s'étendent jusqu'aux plus grandes altitudes. Nous rencontrons le courant de sud-est

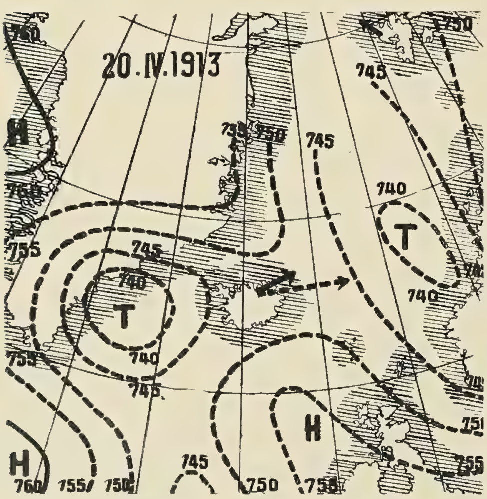
encore à une altitude de 8000 m et davantage! Comment cela s'explique-t-il par la répartition des pressions dans les hautes couches de l'atmosphère?



Akureyri (3000 et 7000 m).

Signification de nos observations au point de vue de la circulation générale.

Nous prenons comme point de départ quelques remarques du vénérable H. Hildebrandsson, faisant allusion à nos résultats de 1909. Il dit que ceux-ci s'expliquent par le fait constaté par lui depuis longtemps, que les maxima au nord desquels se trouve une aire de haute pression, ne sont pas ouverts vers le nord, c'est à dire que les vents supérieurs n'y viennent pas d'ouest, mais d'est. Je ne contredis pas à cette formule, mais je fais remarquer que cela revient à constater qu'au nord de l'Océan Atlantique, à l'ouest du Grœnland et à l'est se trouve donc un maximum permanent qui limite la circulation vers le nord Cette constatation de la permanence de cette calotte polaire de pression élevée, caractérisée par des vents d'est, est précisément un résultat de nos mesures.



Akureyri (3000 et 6500 m). Vents d'W dans un col isobarique.
(Spitzberg SSE. jusqu'à 1100 m).

Elle est aussi à la base des idées schématiques de l'école norvégienne sur l'existence d'un »front polaire«.

Plus loin, Mr. Hildebrandsson caractérise la dépression du détroit de Davis et de la Baie de Baffin, comme un tourbillon stationnaire formé dans une baie existant sur le bord d'un courant d'eau; mais il reste précisément le fait extraordinaire que le courant du sud, formé dans ces »eaux mortes«, a une extension si grande en altitude.

Nous avons essayé de calculer

le gradient supérieur du Grœnland du Sud vers le Groenland du Nord et avons choisi les deux niveaux de 4000 m (qui se trouvent adoptés dans les cartes de Teisserenc de Bort), et de 9000 m. Nous avons admis un gradient thermique vertical de 0,5° par 100 m pour les stations situées au sud (Jakobshavn et Ivigtut), et de 0,3° pour les stations situées plus au nord. Pour la réduction à 9000 m, on a supposé à cette hauteur une température de — 55°. Nous avons cru ces suppositions prudentes en ce sens qu'on a évité un gradient invraisemblable dirigé vers le nord.

Pression à des niveaux supérieurs au-dessus du Groenland.

	Température moyenne	Niveau 9000 m		Température moyenne	Niveau 4000 m	
		hiver 1912/13	janvier grand nombre d'années		hiver 1912/13	janvier grand nombre d'années
		mm	mm		mm	mm
Ivigtut, S.-Gr.	—30°,5	209,1	210,7	—16°,0	436,6	440,0
Jakobshavn, W.-Gr.	—34°,2	206,1	208,0	—23°,0	432,4	436,4
North Star bay, NW.-Gr.	—39°,6	201,1	202,8	—30°,3	427,6	431,2
Borg, NE.-Gr.	—43°,4	199,2	198,8	—37°,8	425,3	424,5

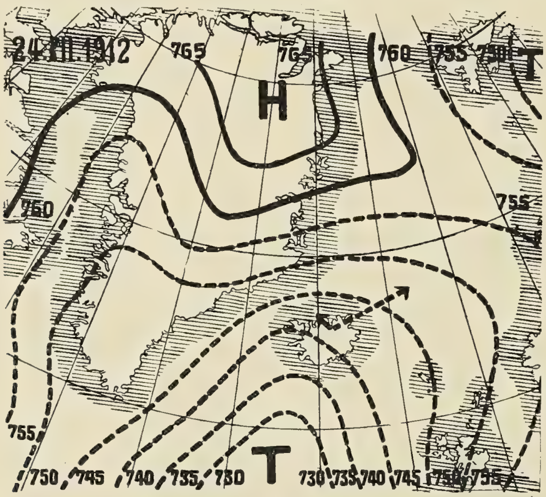
Il résulte de notre tableau que même en hiver 1912—13, où le gradient barométrique du nord du Grœnland vers le sud était de 17 mm au sol, on trouve une différence de pression inversée de 11 mm déjà à 4000 m de hauteur et une différence de 10 mm à 9000 m de hauteur. Les isobares auraient une orientation ouest-est (alors que Teisserenc de Bort avait indiqué sudouest-nordest).

Ainsi ce calcul amène de nouveau à la supposition d'un courant d'ouest passant par dessus le Grœnland, c'est à dire à un tourbillon polaire existant aussi au nord du cercle polaire. Seulement nos observations s'y opposent.

Pour arriver dans les hautes couches de l'atmosphère à une répartition de la pression qui corresponde à nos observations, il faudrait admettre les très basses températures de l'anticyclone sur le nordest du Grœnland comme tout à fait locales et comme s'étendant très peu en hauteur, et un gradient vertical thermique très faible devrait y permettre le maintien des hautes pressions dans les hautes couches. Quelle que soit l'explication des hautes pressions polaires et de leur maintien même dans les couches plus élevées, on arrive à la conclusion générale que le tourbillon polaire tel que la météorologie l'avait admis depuis longtemps, n'existe pas et qu'il convient de parler d'une zone de tourbillons sub-polaires; et nous ajoutons que cette zone de tourbillons sub-polaires, limitée vers le nord par les courants d'est polaires correspondrait, d'après les hypothèses norvégiennes

récentes, à cette zone de contact de l'air polaire avec l'air subtropical. Et les tourbillons eux-mêmes, au moins dans leurs phénomènes aux hauteurs basses et moyennes, s'expliqueraient par les surfaces de discontinuité qui seraient la conséquence du contact de ces deux masses d'air d'origine différente.

Nous devons encore toucher à un autre point: celui de l'étendue du tourbillon situé sur le détroit de Davis et sur la Baie de Baffin. Jusqu'ici les stations manquent absolument pour le limiter. Les cartes de Hoffmeyer supposent que le terre de Baffin se trouve déjà en arrière; par contre les observations de l'année polaire (surtout les observations au Fort Rae 115° W, 62° N, donnant des vents nord-ouest très marqués dans les hautes couches) feraient penser que ce minimum comprend encore l'archipel de l'Amérique arctique. L'étude de cette question encore ouverte a été attaquée par la commission polaire en 1914 en corrélation avec les plans de M. Amundsen. La guerre a détruit l'espérance d'une solution prochaine; mais depuis lors une activité nouvelle se dessine. Nous notons l'heureuse expédition météorologique vers le nord que nous devons surtout à l'initiative des Norvégiens. D'autres suivent, le Danmark profette des postes émetteurs au Grœnland, et nous pouvons espérer que le jour pas trop éloigné viendra où les observations d'expéditions isolées comme la nôtre seront remplacées par un réseau permanent, contrôlant toute la calotte polaire et promettant des progrès pratiques pour la météorologie synoptique.



Akureyri (5000 et 10000 m) Malgré les hautes, pressions au nord : vents d'ouest.

Sixième Section.

Travaux de l'escouade occidentale.

Y ont pris part:

Le Dr. P.-L. Mercanton, le Dr. A. Stolberg et le Dr. W. Jost sous la direction de P.-L. Mercanton.

Elaboré et rédigé par P.-L. Mercanton.

Cartographie.

Le programme de travail de l'Escouade occidentale était avant tout météorologique et géophysique; la topographie devait simplement venir en aide, s'il le fallait, à la glaciologie.

Le lever du Nùnap Kigdlingâ et de la portion adjacente de l'inlandsis à 1 : 50000 résulte de cinq levers distincts:

La carte du front de l'Ekip Sermiâ et de la région de Port-Quervain est basée essentiellement sur un panorama photogrammétrique pris d'un point de la côte faisant face au glacier, à l'aide d'une petite chambre de Finsterwalder-Sedlbauer.

Ce même instrument nous a permis la cartographie du front de l'inlandsis au Nùnap Kigdlingâ ainsi que du Sermerk Kùjadlek. Le lever du front de ce secteur de l'inlandsis et de la plateforme qu'il domine, s'est fait en partie photogrammétriquement, en partie à l'aide du théodolite universel établi tour à tour sur les sommets du Søndagsfjeld et du Frysefjeld.

La carte du Sermerk Kùjadlek a été dessinée à 1 : 50000 par le professeur Charles Jacot-Guillarmod †, d'après mes clichés photogrammétriques, puis réduite à 1 : 10000 par M. Leupin, ingénieur topographe, qui, en outre, avec le désintéressement le plus complet, a bien voulu mettre toutes mes cartes en forme définitive de tirage.

J'ai construit et esquissé le secteur d'itinéraire compris entre Port Quervain et l'inlandsis en combinant une série de recoupements trigonométriques obtenus aux Søndagsfjeld et Frysefjeld, avec les éléments d'un lever expédié, exécuté par Jost et moi le 5 août 1912. Nous disposions d'un excellent télémètre à mirage (Goerz), instrument qui nous a beaucoup facilité la préparation des préliminaires de certains travaux et la réalisation définitive de certains autres. Il était utilisable entre 400 et 4000 m, avec une erreur relative moyenne croissant de 0,2 à 2 $^0/_0$ avec la distance.

Enfin les pourtours des principales nappes d'eau ont été restitués photogrammétriquement.

La petite carte d'ensemble à 1 : 500000 est destinée avant tout à orienter le lecteur et ne prétend pas à une grande précision. En ce qui concerne les côtes, elle ne fait que reproduire les linéaments de la carte de Hammer (1878—1880), complétée par Engell (1902—1904). En revanche, elle rectifie avec tout le soin possible le dessin de la région marginale de l'inlandsis et des nounataks qui surgissent entre le Torsùkatak et le Sermerk Kùjadlek.

Enfin la petite carte à 1 : 5000, qui figure le lobe frontal sud du Lyngmarksbrae (Disco), n'a pas d'autre but que d'en fixer l'état, le 2 septembre 1912, pour permettre le contrôle de ses variations ultérieures.

P.-L. M.

L'inlandsis dans les parages de Nunap Kigdlingâ.

La partie de l'inlandsis où l'Escouade de la côte occidentale a concentré son activité s'étend du sud au nord, du Sermerk Kùjadljek au chapelet de pointements rocheux reliant le grand nounatak d'Ilùlialik au SW, à celui des »Suisses« au NE, à la cote 630 m. De l'W à l'E cette région va du front de l'Ekip Sermiâ au premier bivouac, sur le glacier, du Groupe de la Traversée.

Du point de vue glaciologique, on peut diviser ce territoire en deux parties bien différentes: celle, relativement unie, qui s'étend à l'E du Nùnap Kigdlingâ et celle, presque partout bouleversée, où l'inlandsis s'individualise en l'effluent Ekip Sermiâ à partir d'un seuil allongé du S au N, vers 700 m d'altitude.

Nous avions prévu d'emblée l'étude instrumentale du mouvement dans un secteur frontal de l'inlandsis où celui-ci vînt se dissiper calmement en terrain solide plat, sans concentration notable des glaces. Jusqu'alors on n'avait en effet guère étudié que des effluents débouchant dans la mer par des vallées étroites et réunissant les glaces de vastes et indéterminées portions de l'inlandsis.

Le front de l'inlandsis au Nùnap Kigdlingâ, du Søndagsfjeld (569 m). Au fond le Jostfjeld (660 m).
Phot. Mercanton 26 VII 1912.

Le front du Nùnap Kigdlingâ.

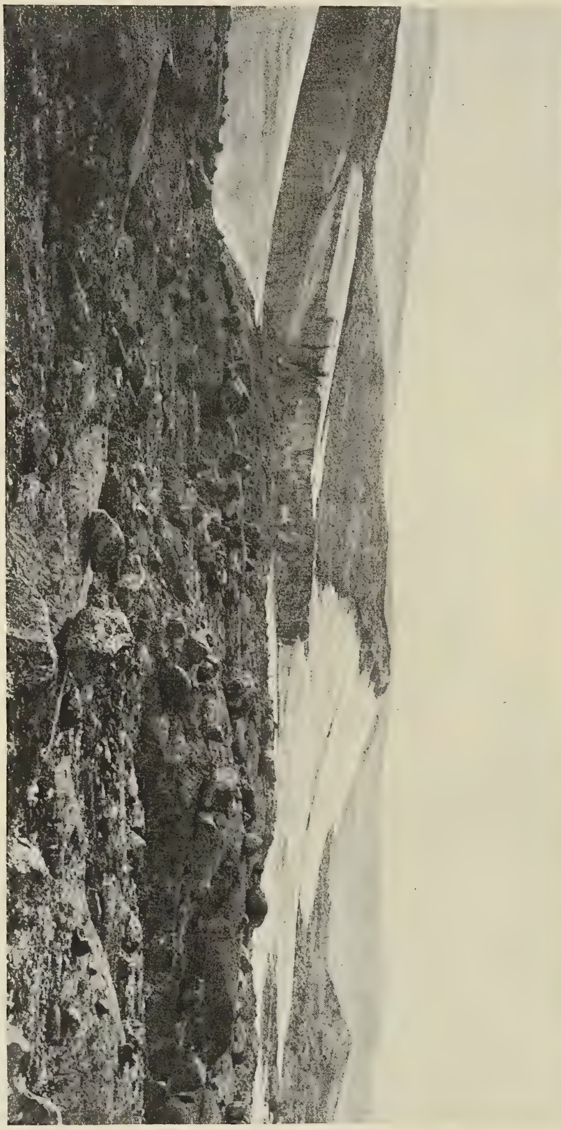
Aux abords immédiats du Nùnap Kigdlingâ, c'est-à-dire à l'E et au SE de sa partie la plus élevée l'inlandsis se présente, dans ses grands traits, comme un étagement de terrasses reliées par des plans faiblement inclinés; dans le détail, on y rencontre, bien entendu, des irrégularités nombreuses, monticules, vallécules, etc. mais toujours à reliefs adoucis.

C'est par la traversée de cette zone tranquille que l'Expédition a débuté. Les régimes de crevasses étaient peu fréquents et faciles à

N

Terrasse rocheuse devant l'inlandsis au Nùnap Kigdlingâ vue du Søndagsfjeld. Au fond le nounatak d'Ilùlialik.
Phot. Mercanton 26 VIII 1912.

éviter. De loin en loin, un étang, profond de quelques mètres à peine, trahissait l'existence d'une dépression légère; parfois quelque ruisseau y serpentait, le plus souvent aisé à franchir, quelquefois trop large



Le front de l'inlandsis au Nùnap Kigdlingâ; à droite le Søndagsfjeld (569 m); au premier plan: la brèche et son lagot.

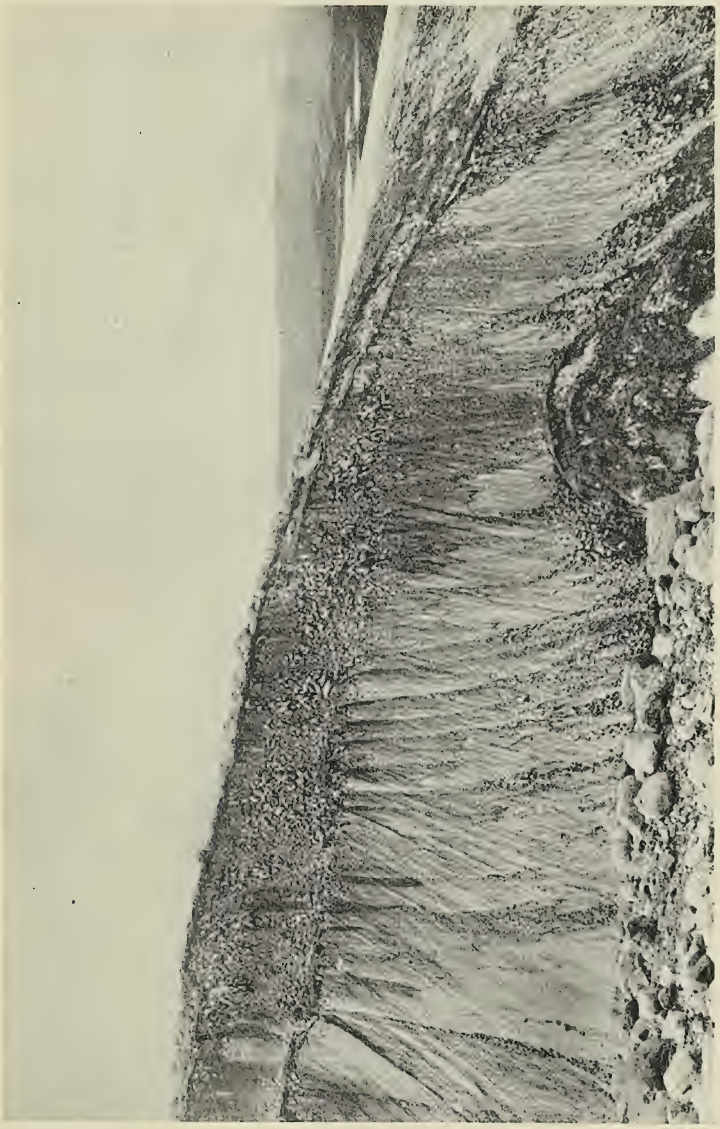
Phot. Jost 30 VII 1912.

et forçant à un long détour, tel celui qu'il nous fallut contourner par son origine, le 22 juin, à la cote 910 m.

Au début de juin, la surface, à peine délivrée des neiges de la saison, froide était encore relativement unie, mais le soleil persistant de l'été eut tôt fait d'approfondir les trous à cryoconite dont elle était criblée

et les lits des ruisselets qui la sillonnaient partout. Elle devint alors fort incommode pour le halage des traineaux et même pour la marche.

La partie de beaucoup la plus intéressante de ce secteur inlands-



La tranchée dans le moraine frontale de l'inlandsis au Nùnap Kigdlingâ. Moitié aval.
Phot. Jost 11 VII 1912.

isien est certainement son front même. De la terrasse rocheuse du Nùnap Kigdlingâ à la cote 550 m, sur laquelle il se dressait en 1912, il apparaissait comme un grand talus neigeux, à pente de 35 $^0/_0$ environ, couronné d'une crête morainique continue. Cette crête était faite de matériaux allant du grain de sable au bloc d'un mètre cube et plus. Elle ne différait en rien des moraines frontales des glaciers

alpins. Sa largeur n'excédait pas une dizaine de mètres au maximum. Elle formait talus aussi du côté de l'inlandsis, qu'elle dominait de 4 à 5 m. De ce côté cependant, la densité du revêtement pierreux allait

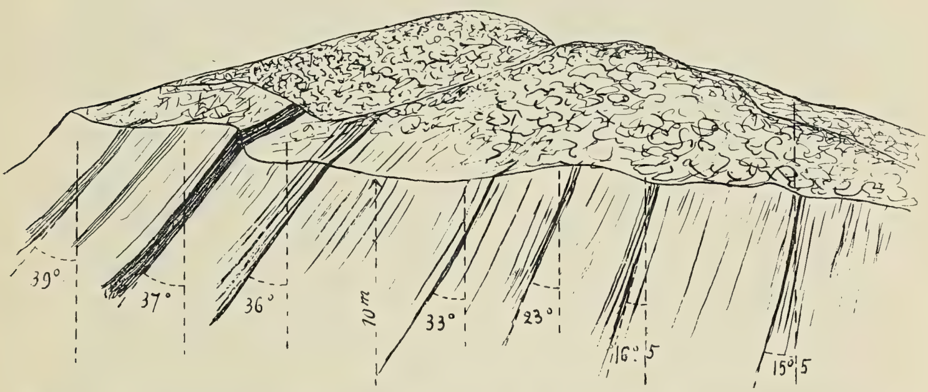
La tranchée dans la moraine frontale de l'inlandsis au Nùnap Kigdlingâ. Moitié amont.
Phot. Jost 11 VII 1912.

diminuant rapidement sur les premiers mètres à partir de la crête pour s'uniformiser ensuite dans une première zone, large de 70 m où, sur un fond de sable, de gravier et de petites dalles assez serrées s'étendait un véritable semis de gros blocs aux contours arrondis. Une deuxième zone, de même largeur lui succédait sans transition. Les mêmes matériaux s'y étalaient et de la même façon, mais beaucoup moins abon-

dants. La glace y était légèrement teintée par d'infimes débris. Cette baude faisait place brusquement à la glace propre, d'un blanc bleuâtre, du reste de l'inlandsis. A partir de là jusqu'à 60 m en amont à peine, on trouvait encore quelques blocs isolés, aux arêtes émoussées et de volume médiocre puis plus rien que la glace, à perte de vue.

La nature pétrographique de tous ces matériaux morainiques était extrêmement diverse et leur mélange semblait complet.

Une heureuse rencontre, du 11 juillet 1912, nous a dévoilé la structure intime de cette grande circonvallation morainique: à mi-chemin



Structure rubannée de la moraine frontale de l'inlandsis au Nùnap Kigdlingâ.
Croquis de Mercanton VII 1912.

entre le Dépôt III et le Jostfjeld, un ruisseau avait coupé transversalement et d'outre en outre le rempart terminal. Aux flancs lisses et abrupts, hauts de 10 m environ de cette tranchée, on distinguait nettement la structure rubannée du glacier. Elle se présentait comme un empilement de feuillets, d'épaisseurs variant de quelques centimètres à quelques décimètres, légèrement incurvés. On eut dit de la tranche d'un livre.

Du côté de l'inlandsis, un étroit faisceau de ces feuillets était tellement pétri de matériaux morainiques qu'il en paraissait noir; de gros blocs s'en échappaient. C'est sans doute de ces feuillets souillés que la crête de la moraine tenait sa richesse en cailloux.

Le croquis donne les positions approximatives avec leur inclinaison sur la verticale des principaux feuillets. Ces derniers allaient de 39°, du côté de l'inlandsis à 15,5° et même moins du côté extérieur (talus neigeux). Le feuillet très sale avait 37°. Ainsi donc les feuillets se redressaient vers le talus, comme devant un obstacle; il m'a même paru que ce redressement allait, dans le talus même, jusqu'à la verticalité et qu'en outre les feuillets de l'inlandsis s'affrontaient à un jeu pareil de feuillets mais inclinés en sens inverse et appartenant au talus

neigeux. L'ensemble des feuillets aurait eu ainsi la disposition des lames d'un éventail déployé vers le bas.

Ceci impose aussitôt l'idée que le talus neigeux est en réalité un glacier secondaire ou annexe et formé par les neiges que les vents d'E, dominants, chassent de l'intérieur vers la marge de l'inlandsis. Elles s'accumulent alors devant la moraine frontale, forçant, par réaction, les strates du grand glacier à se redresser, avec, comme conséquence, la formation d'un couronnement morainique terminal.

La grosseur du grain de ce placage, beaucoup plus faible que celle

Moraine frontale de l'inlandsis au Nùnap Kigdlingâ et glacier parasite en bordure. Phot. Mercanton 23 VII 12.

du grain de l'inlandsis même, plaide en faveur de cette origine secondaire.

Ce glacier annexe est-il permanent? Je n'en sais rien. Peut-être n'a-t-il pu se former qu'à la faveur d'une crue derrière le bombement temporaire du front de l'inlandsis.

Cet appareil frontal se développait sur une longueur de 7 km environ, à peu près de S au N, mais à $2^1/_2$ km de son extrémité méridionale un accident en rompait l'uniformité: le rempart morainique s'ouvrait pour laisser passer une langue de glace, qu'il encadrait de ses deux lambeaux, arqués vers l'aval. Cette langue aboutissait par un front large de 200 m au plus, dans un lagot bordier d'où s'échappait un ruisseau assez fort qui rejoignait par un ravin, proche de la Station, le lac de la cote 425 m, en cascadant.

Le segment méridional de la grande moraine frontale culminait à 614 m, un peu au sud du Dépôt III, dominant une région assez plane de la terrasse préinlandsisienne (540 m). Deux sommets rocheux s'enlevaient en relief sur ce terrain, à 569 m d'altitude tous les deux, le Frysefjeld et le Søndagsfjeld.

Le segment septentrional du front comportait comme l'autre un système morainique, savoir: un rempart principal, large de quelques décamètres, dominant les glaces voisines et la terrasse préinlandsisienne, puis la double zone sale plus haut décrite. Cet ensemble se terminait brusquement à l'endroit où le pourtour du Nùnap Kigdlingâ s'infléchit du nord vers l'W pour faire place au cours naissant des glaces du grand effluent Ekip Sermiâ. Devant ce segment se dressait le sommet du Jostfjeld, à 660 m au-dessus de la mer. P.-L. M.

Le Sermerk Kùjadlek.

A son extrémité méridionale, la grande moraine, faisant un coude subit vers l'W s'en venait border sur une certaine longueur, en s'abaissant aussi, le cours supérieur du Sermerk Kùjadlek.

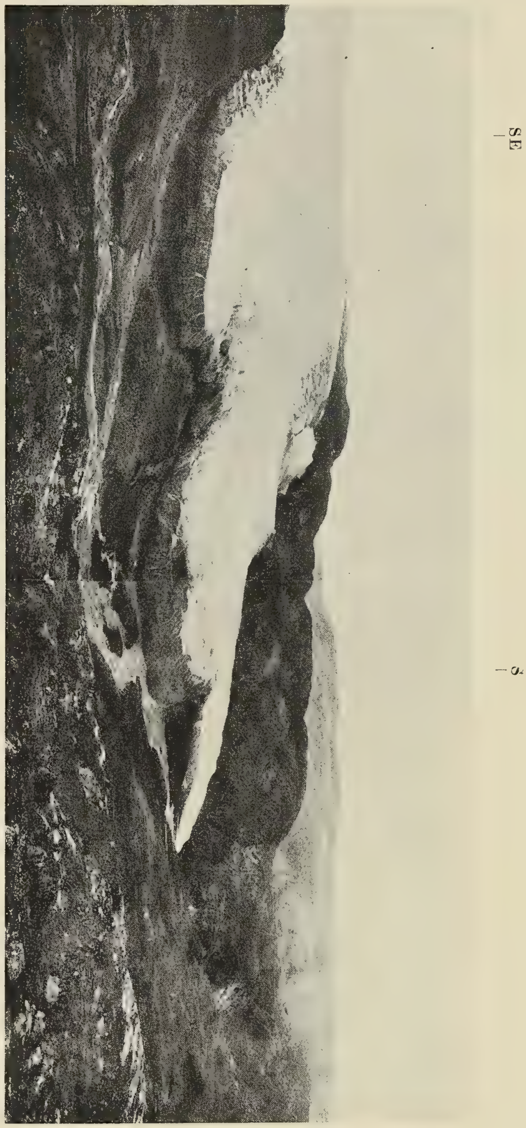
Cet effluent, à peine plus long que large, se différentie de la nappe inlandsisienne à la cote 550 m, précisément celle de la terrasse où se dresse le front principal. C'est, en fait, la dite terrasse qui se continue simplement vers le sud sous les glaces, lesquelles paient ici leur individualisation en un effluent véritable, d'une chute brutale jusqu'à la cote 400 m. La cataracte ainsi formée se déploie à travers le glacier entier sur $1^1/_2$ km de largeur. En amont de ces rapides quasi infranchissables, le glacier est disséqué par de nombreux régimes de crevasses, nettement circonscrits et formant autant de plages bouleversées, inaccessibles, séparées par d'étroites zônes plus tranquilles et traversables, disposition d'ailleurs commune à tout le dissipateur de l'inlandsis.

Au pied de la cataracte, les glaces du Sermerk Kùjadlek, calmées, s'épandaient dans un véritable amphithéâtre rocheux, cirque limité au N par la base même du Søndagsfjeld, à l'W par une chaîne rocheuse arquée (altitude moyenne 450 m). Cette chaîne est séparée du Søndagsfjeld par un col (432 m) d'où part la vallée descendant sous la terrasse de la Station jusqu'au lac de la cote 390 m. Enfin l'amphithéâtre est fermé au S par une ligne de hauteurs qui isole cette dépression de la grande vallée, toute proche, de l'Ekip Kugssuâ.

L'extrémité même de l'effluent s'engageait dans une cluse, large d'une cinquantaine de mètres, profonde de quelques centaines, par laquelle le torrent glaciaire s'en allait, à un demi kilomètre de là, confluer avec la grande rivière.

Fait digne de remarque: le bord gauche du Sermerk Kùjadlek était complètement dénué de moraines latérales. Les lobes frontomarginaux du bord droit en étaient également démunis à l'exception d'un liseré de matériaux morainiques qui souillaient les strates les plus proches du lit. Au milieu même de l'effluent, on ne rencontrait que de loin en loin de rares blocs arrondis et de petite taille. Quant

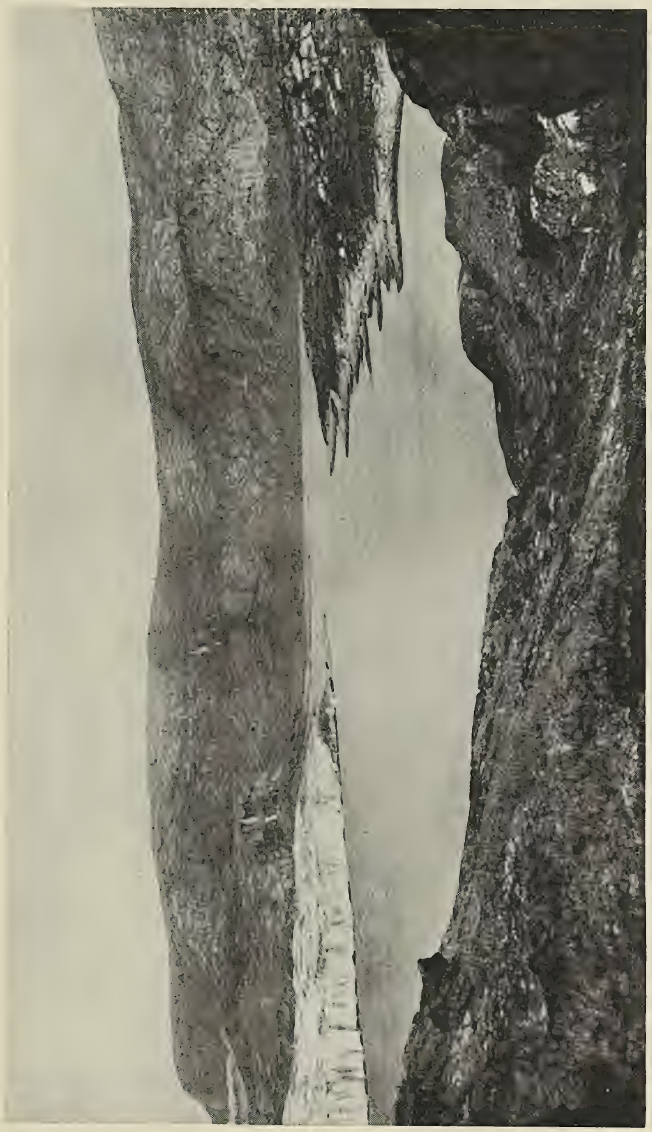
à l'extrémité même de la langue (alt. 150 m), dans la cluse, elle ne montrait non plus aucune trace de moraines frontales. Sur une vingtaine de mètres, cependant, devant le front, le sol était recouvert de



Sermerk Kújadlek (effluent du sud) du point 470 m, vers le sud.
(Au flanc des montagnes du fond: terrasses fluvioglaciaires de bordure).
Phot. Mercanton 13 VIII 1912.

quartiers de rocs, d'aspect tout frais. Nous sommes vraisemblablement arrivés sur les lieux comme le glacier sortait de crue. D'autres faits d'ailleurs le démontrent: en longeant le lobe le plus septentrional, le 6 juillet 1912, nous avons vu tomber de sa paroi terminale quantité de cailloux libérés par la fonte. Or en maint endroit, ces chutes de pierres avaient recouvert des gazons bien développés, où se voyaient

encore entr'autres des pieds de Salix repens et de Rhododendron laponicum, d'âge notable, morts ou encore vivants. Quelques uns étaient déjà pris sous la glace.



Port Quervain dans le Nadlùarsùk, Grönland W. Vue vers le NE.
A gauche l'Ekip Sermiâ; à droite, le campement.
Phot. Jost août 1912.

Le 13 août, le front avait légèrement reculé; il était sur tout son pourtour à 2 m en arrière de sa position d'avance maximum.

L'effluent Ekip Sermiâ.

Immédiatement au N du Nùnap Kigdlingâ, entre les parallèles de 69°46′ et 59°57′ et les méridiens de 49°40, et 50°20′, s'étend le

Le front de l'Ekip Sermiâ à Port-Quervain. »Fox« au mouillage.

Phot. Jost 10 IV 1912.

bassin de concentration des glaces de l'Ekip Sermiâ, le grand effluent qui dresse sa haute falaise terminale dans le Natlùarsùk, ce recoin du littoral où se cache Port-Quervain. Ce bassin est limité au S par le Nùnap Kigdlinga, au N par le grand nounatak côtier d'Ilùlialik qui allonge du SW au NE son échine pelée et domine toute la

La »Nounatak des Suisses« (630 m) vu du premier »courant de glace«, à 18 km. Téléphot. Mercanton 23 VII 1912.

contrée de ses 830 m. A son extrémité NE, cet imposant massif se prolonge sur l'inlandsis par un seuil rocheux, aligné comme lui du SW au NE. Ce seuil englacié, large de 6 km, s'appuie au NE à un nounatak remarquable, le »Nounatak des Suisses« objet de nos convoitises et de nos efforts, hélas! déjoués par le Destin. Son sommet atteint 630 m, sa longueur 2,5 km au moins; quant à sa largeur, elle ne doit guère dépasser 1 km[1]).

La figure qui reproduit un cliché, pris au téléphot Vautier-Schaer, d'un point à 18 km plus au S, près du Nùnap Kigdlingâ, montre bien ce promontoire rocheux, jailli soudainement des glaces, en avant de la rupture de pente par laquelle l'inlandsis dévale de la cote 700 m à la cote 500 m dans un tumulte de séracs. Ce dénivellement brusque marque le rebord occidental d'une terrasse sousglaciaire qui court du N au S, du Nùnap Kigdlingâ à l'arrière du Torsùkatak. Tout du long, la glace y forme un étagement d'assises abruptes, affreusement crevassées, presque partout infranchissables. Ce dispositif culminait en 1912 à la cote 770 m et à 13 km du Nùnap Kigdlingâ, par un véritable éperon de glace à pic.

En amont de cette zone, l'inlandsis recommençait à déployer ses lentes ondulations, mais jusqu'à 50 km au moins de la côte, des traînées de séracs, s'allongeaient d'amont en aval, séparées par des bandes plus

[1]) Le grand nounatak d'Ilúlialik et celui »des Suisses« sont bien visibles sur la figure 1 de la planche IV du 4ième fascicule, 2ième partie, des Meddelelser om Grønland; elle reproduit une photographie prise en 1879 ou 1880 par Steenstrup, de Nùk, sur la rive N du Torsùkatak, vers le SE.

Ils apparaissent aussi sur la planche I du 8ième fascicule des Meddelelser, qui reproduit une esquisse faite par Hammer de la région entière en 1883. On trouvera une copie de cette planche dans O. Nordenskjöld: Le monde polaire.

Rapides de l'inlandsis, en bordure de la route vers le »Nounatak des Suisses«. Phot. Mercanton 18 VII 1912.

unies. Ce phénomène est de règle dans la marge des calottes inlandsisiennes et ne fait que traduire par des inégalités de la surface et de l'écoulement glaciaires les aspérités du lit.

Les glaces amassées dans le bassin de concentration que je viens de définir, s'en échappent par deux ouvertures: la brèche à 500 m d'altitude moyenne entre le grand nounatak d'Ilùlialik et son vis-à-vis le nounatak des »Suisses«, brèche qui ne semble pas debitér beaucoup

Lagot sur l'inlandsis en amont du courant de glace I.
Phot. P.-L. M. 23 VII 1912.

de glace; puis la trouée de Port-Quervain. Ce dernier débouché est de beaucoup le plus important; les glaces s'y resserrent dans un défilé large de 4 km seulement, à peu près aussi long, entre le Nùnap Kigdlingâ et le nounatak d'Ilùlialik. A sa sortie, l'effluent s'épanouit en un front haut de 30 m, sur 8 km de pourtour en éventail.

Le tronçon inférieur de cet Ekip Sermiâ ne montre plus là qu'un hérissement d'aiguilles séparées par des gouffres effrayants.

L'effluent s'encadre de moraines régulièrement développées, mais de dimensions plutôt modestes. Sur la rive gauche, et dominant le

Le nounatak d'Ilùlialik (extrémité NE) et ses gradins, vers du sud à 10 km. Au fond: montagnes du Torsùkatak.
Telephot. P.-L. M. 23 VII 1912.

glacier extérieurement d'une trentaine de mètres, s'allonge une seconde crête morainique, déjà partiellement envahie par la végétation et dont l'extrêmité inférieure forme dans la lagune de Port-Quervain une digue à demi submergée.

Entre le Nùnap Kigdlinga et le nounatak des »Suisses«, l'effluent présente des alternances de régions déchiquetées — que j'appellerai des »courants de glace« — et de surfaces plus unies. Une première reconnaissance, du 9 juillet, nous mit en présence, à l'extrémité septentrionale du Nùnap Kigdlinga, d'un premier courant, bande large d'un kilomètre à peine, infranchissable déjà, pour un traineau même peu chargé. Les glaces y étaient découpées en grandes assises, arquées vers l'aval et séparées par de véritables gouffres.

Au delà de ce premier courant et séparé de lui par une plaine vallonnée, se déployait un »second courant«.

Celui-ci étendait de l'W à l'E un système d'immenses crevasses

et de ravins longitudinaux. Les crevasses n'étaient pas très larges mais avaient parfois plusieurs certaines de mètres de longueur. Celle des ravins dépassait 100 m; ils avaient 50 à 80 m de largeur et 15 à 20 m

Crevassement du »Courant de glace« I; Ekip Sermiâ. Phot. Mercanton 23 VII 1912.

de profondeur. Leurs flancs nord étaient plus raides que leurs flancs sud. Le crevassement procédait à la fois du cheminement vers la mer et d'un déversement vers la plaine de glace unie située au N en contrebas. Le dit »courant« avait à peine 2 km de largeur: sa traversée exigea pourtant chaque fois au moins 4 heures d'efforts, avec corde, piolet et crampons. Nous avons fait six fois cette traversée, avec ou sans charges, et

malgré la plus grande attention, nous n'avons jamais réussi à suivre deux fois à peu près le même itinéraire.

Notons ici quelques particularités de ces grands crevassements de l'inlandsis.

Amas morainique du »Dépôt inondé« (500 m). (Au fond les montagnes de Nùgsuak).
Phot. Mercanton 18 VII 1912.

Tout d'abord remarquons que le fond, tant des ravins aux versants inclinés que des gouffres à parois verticales, étaient rarement obturés au point de garder l'eau de fonte. Les uns et les autres se rétrécissaient rapidement à quelques dizaines de mètres sous la surface du glacier, mais, à ce niveau, apparaissait un nouveau régime de fissures. Dans les gouffres du courant I, ces fissures s'enchevêtraient de façon

impossible à débrouiller; dans le fond des grands ravins du courant II, elles isolaient des séries de lames de glaces, parallèles, reliant les bas des versants du ravin, lames manifestant presque toujours à la fois une double courbure et une inclinaison d'amont en aval. Ces particularités résultaient sans doute d'un mouvement différentiel des deux parois du ravin dans le sens de son axe avec rapprochement lent des versants et flambage corrélatifs des lames.

Enfin, les parois des grands gouffres, surtout les parois amont,

Le lagot formé par la tempête du 16 juillet 1912 sur l'emplacement de notre dépôt de vivres, à l'amas morainique.
Phot. Mercanton 18 VII 1912.

surplombantes, montraient une structure écailleuse, manifestée par la présence de lames, de prismes, d'aiguilles, de feuillets etc., en saillie sur la paroi.

Des hauteurs du courant II, nous avions, dès le 9 juillet, aperçu une double tache noire sur la blancheur du glacier[1]) au pied de l'escarpement qui aboutit au Nounatak des »Suisses« et à une quinzaine de kilomètres du Nùnap Kigdlingâ. Le 15 juillet, nous y parvînmes et nous constatâmes qu'il s'agissait de moraines médianes sporadiques, surgies de la base des rapides glaciaires. C'était un ensemble morainique, en chapelet irrégulier, long de près d'un kilomètre, large d'une centaine de mètres, qui culminait à 70 m au-dessus de la nappe de glace tranquille environnante. Il était fait de matériaux de moraines profondes, presque toujours de petite taille et de nature pétrographique très variée. Un torrent longeait au nord le segment de la moraine où

[1]) Ces taches sont visibles à droite sur la téléphotographie.

nous avions établi un dépôt de vivres et de matériel en vue du raid projeté vers le nounatak. Quand nous y revînmes le 17 juillet, après une journée de mauvais temps qui nous avait emprisonnés sous la tente et avait fondu beaucoup de glace, l'aspect des lieux était méconnaissable, un étang d'eau boueuse occupait l'emplacement de notre dépôt de vivres et un canion, profond de 8 m, large de 6, y aboutissait. Du dépôt nulle trace et ce désastre donna le coup de grâce à notre espoir d'atteindre le nounatak.

Au confluent des deux »courants« de glace crevassés, le déchirement est beaucoup moins formidable et les inégalités de la surface se muent en ravins étroits serpentant entre des pitons de glace, imposants d'ailleurs mais livrant passage entre eux. Les ruisseaux, avec leurs méandres encaissés sont beaucoup plus gênants.

D'une manière générale, on jugera bien de la difficulté de ces randonnées dans les glaces marginales de l'inlandsis quand on saura que, Jost et moi, porteurs à la vérité de lourdes charges mais très entraînés aussi, nous avons mis, chaque fois près de 12 heures avec le minimum de haltes, pour effectuer le parcours entre l'amas morainique et le traîneau laissé au bord sud du courant I; la distance à vol d'oiseau n'atteint cependant pas 13 km. Dans l'espace vaguement triangulaire que limitent, à l'E et en amont l'escarpement de la cote 700 m, au sud et au nord les courants de glace I et II, la structure rubannée était nettement verticale; les bandes, épaisses de quelques centimètres à quelques décimètres couraient en général de l'E à l'W. P.-L. M.

Le terrain glaciaire.

Les formations géologiques des régions visitées par l'Escouade de l'W appartiennent uniformément à l'archéen. Le gneiss en constitue l'élément essentiel; dans cette région du Torsùkatak il s'étend partout avec des faciès d'ailleurs changeants. Parfois il tourne à la syénite, parfois il se rapproche de la diorite. Enfin, il revêt très souvent le caractère de véritables micachistes (Sylow, 1883). On y rencontre fréquemment des injections massives de granit rouge ou gris: A $2^1/_2$ km de Port-Quervain, par exemple, un mamelon de granit rose surgissait de la côte, à 25 m au-dessus de la mer, en face de l'Ekip Sermiâ.

Tout l'avant-pays de l'inlandsis a subi avec intensité l'action désagrégeante des intempéries. Le gneiss y est en effet fortement diaclasé et la rigueur du climat comme aussi la pauvreté du sol en humus s'opposent au développement d'un tapis végétal protecteur.

Ce qui frappe le plus c'est a) la minceur et la rareté des revêtement de matériaux erratiques; b) l'intensité de l'attaque du roc par la gélivure; c) la persistance des polis glaciaires.

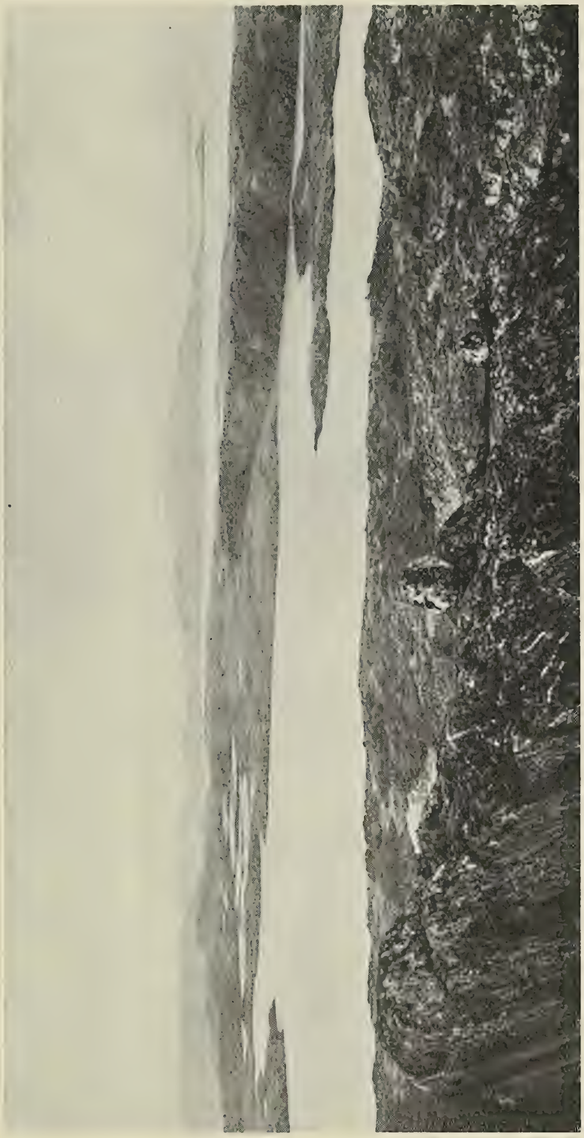
Au Nùnap Kigdlingâ le littoral déglacié est étroit et sa libération récente. La déglaciation a mis à nu un terrain montagneux, coupé de vallons accentués, troué de lacs profonds et nombreux. La carte à 1 : 50000 met en évidence ce caractère du relief. Si elle eût pu embrasser tout le terrain compris entre l'Ekip Kugsuâ et l'effluent Ekip Sermiâ, elle eût imprimé chez le moins excavationniste des glaciologues l'idée que l'inlandsis est le fauteur principal de ces accidents remarquables du modelé. Sans doute, la disposition générale, en terrasses parallèles à

Le »Tasersùak« (365 m), au Nùnap Kigdlingâ, vu du sud.
Phot. Mercanton 5 VIII 1912.

la mer, du sol inlandsisien ne paraît pas attribuable au glacier, mais le travail de celui-ci semble avoir transformé ces ondulations en véritables sillons, voire en vraies fosses.

Au Nùnap Kigdlingâ, tous les versants orientés vers l'inlandsis sont en pente plutôt douce; le rocher y a des formes arrondies et des surfaces lisses. Tous les flancs tournés vers la mer sont au contraire abrupts, souvent verticaux, et le rocher y est couvert d'aspérités révélant sa destruction par arrachement. Cette dualité morphologique est particulièrement marquée dans la région des lacs. On la retrouve, localement et en petit, un peu partout. Le terrain au voisinage immédiat de l'inlandsis, à la cote 550 m, nous en a fourni un merveilleux exemple: un mamelon gneissique, étendu dans la direction E.W, long d'une cinquantaine de m, large d'une quarantaine, élevait à 4 ou 5 m au-dessus des alentours une tête arrondie, d'une régularité remarquable. De loin, rien ne semblait entamer l'uniformité de cette croupe rocheuse, aux flancs lisses, semés à peine de quelques blocs erratiques. De plus près, on con-

statait qu'une véritable fosse creusait toute la partie centrale de ce mamelon. Cette excavation avait un fond plat et des flancs abrupts, même verticaux par endroit. Elle s'ouvrait vers l'aval tandis qu'a-



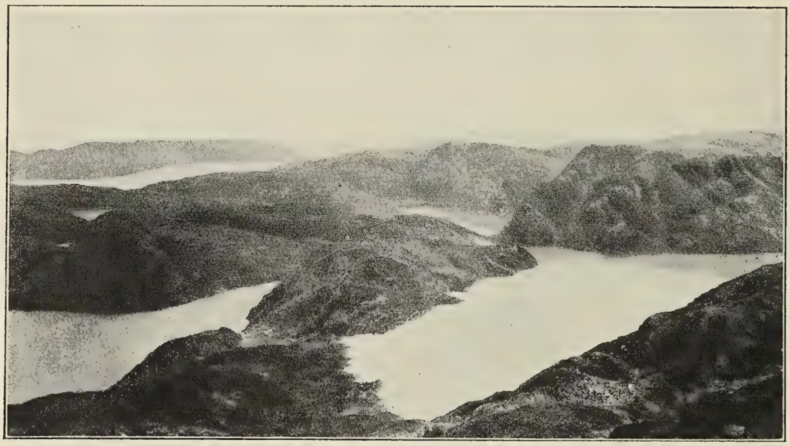
Etang deraut l'inlandsis; Nùnap Kigdlingâ au second plan l'Ekip Sermiâ; au fond le nounatak d'Ilùlialik.
Phot. Jost, 26 Juillet 1912.

mont elle se terminait en cul-de-sac. Cette impasse était longue de quelque 30 m, large de 6 environ, et profonde de près de 2 m. On ne peut se défendre de voir dans cette formation remarquable les effets combinés d'une action abrasive exercée par la pression des glaces sur les surfaces opposées à l'écoulement de celle-ci et d'un travail érosif

arrachant la matière sous le courant, probablement à la faveur d'une fissuration préexistante du mamelon.

Pareil arrachement de la roche nous est apparu aussi au flanc droit de la gorge du torrent du Sermerk Kùjadlek: à une vingtaine de mètres en avant du front on y voyait un amoncellement de dalles fraîchement détachées du roc en place par la crue récente.

On peut également tirer argument, en faveur de l'action excavatrice du glacier, de la forme en amphithéâtre du terrain devant le Sermerk Kùjadlek, de même de celle du fond de la crique de Port-Quervain.

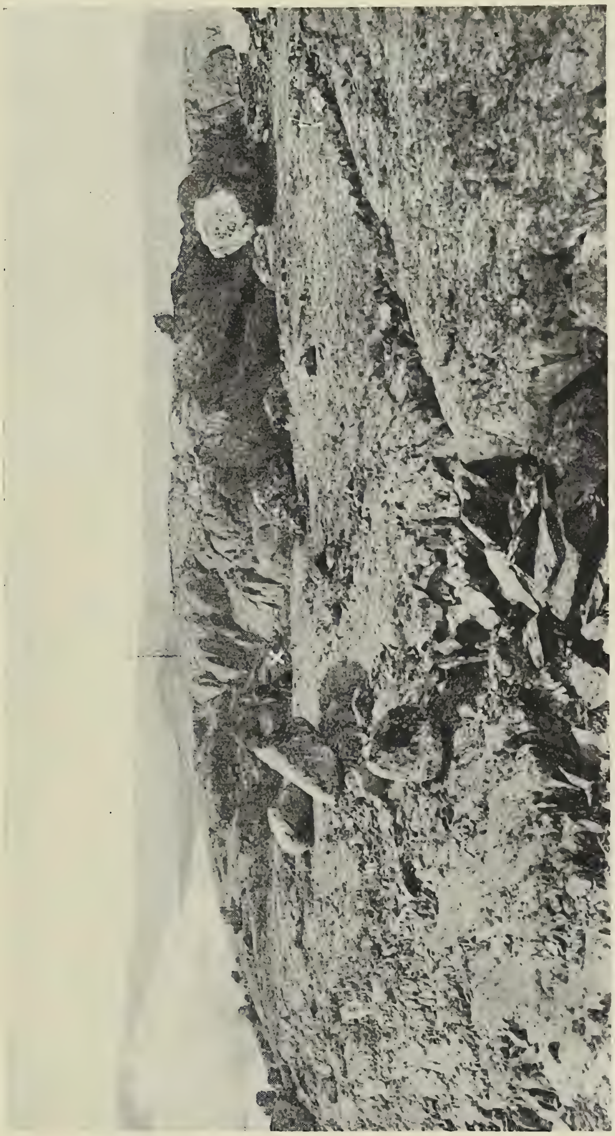


Les lacs au Nùnap Kigdlingâ (au: fond l'Ekip Sermiâ, Ilùlialik).
Phot. Mercanton 5 VIII 1912.

Ces bassins aux pourtours arrondis, aux flancs abrupts font penser aussitôt au travail de quelque gouge gigantesque.

J'ai signalé plus haut le peu d'importance des revêtement erratiques. Qu'il s'agît de moraines proprement dites ou de placages de matériaux glaciaires, cette pauvreté nous a frappés partout. Les niveaux d'ancienne englaciation seraient très malaisés à reconnaître s'ils n'avaient fréquemment pour témoins des formations fluvioglaciaires discernables de loin; en effet, ils sont souvent soulignés par des talus de sable et gravier, à éléments roulés, triés par lévigation et disposés en terrasses alluviales, avec un rebord supérieur horizontal. Ce sont les vestiges de lacs temporaires créés par l'été au bord de l'inlandsis; la glace formait une de leurs rives, le terrain, l'autre. Nous avons rencontré un chapelet de tels lacs vers 500 m d'altitude sur le bord gauche de l'Ekip Sermiâ. De même on voyait aux flancs de la vallée de l'Ekip Kugsùà deux niveaux pareils. Les mêmes se retrouvaient au sud d'Atâ, le long de l'Ikerasak et se correspondaient d'une rive à l'autre. L'inlandsis a donc eu dans toute cette région au moins deux niveaux de stationnement.

C'est bien ce que montrent aussi les revêtements morainiques des flancs du grand nounatak d'Ilùlialik; j'y ai nettement reconnu deux stades d'englaciation. L'un très marqué est à environ cent mètres au-

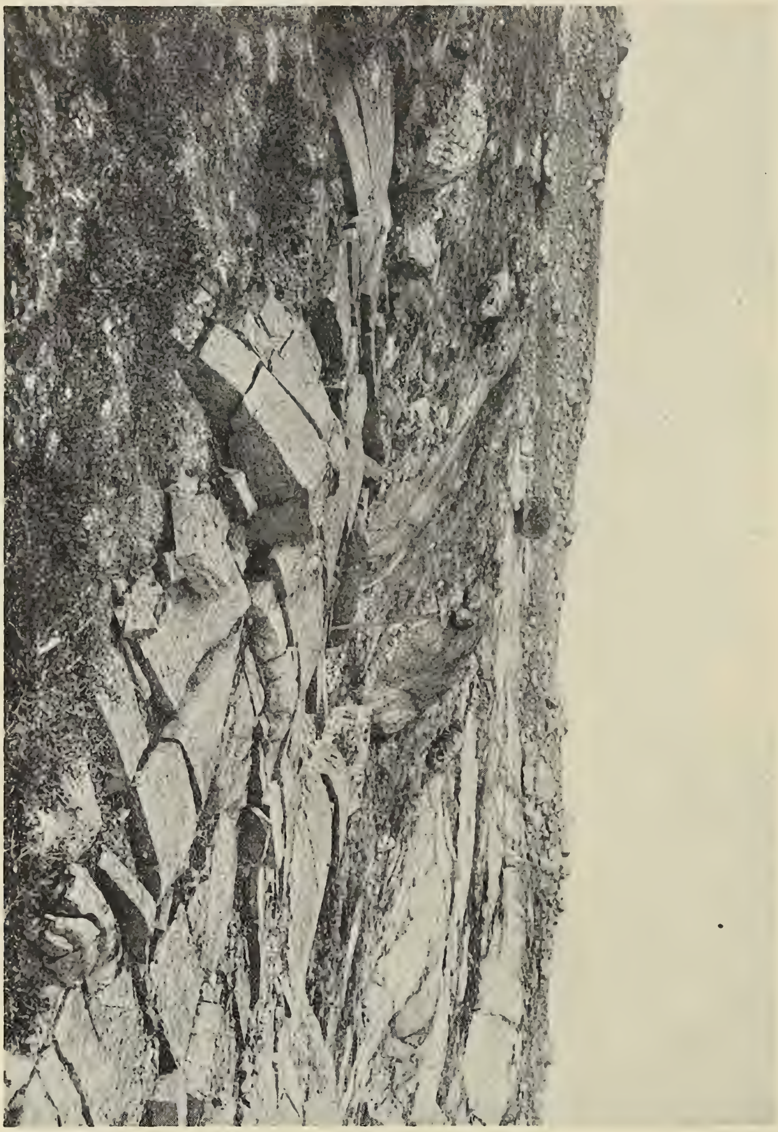


Mamelon poli et érodé par l'inlandsis au Nûnap Kigdlingâ (Remarquez personnage debout ×, piolet et bloc »perché« à droite.

Phot. Jost 30 VII 1912.

dessus de l'inlandsis, l'autre, moins net parce que plus ancien, à une cinquantaine de mètres au-dessus du premier. Le nounatak obstruant le cours des glaces, celles-ci ont dû refluer contre l'obstacle et les liserés morainiques ont pris en conséquence une inclinaison notable d'amont en aval. D'ailleurs, ce nounatak qui culmine à 830 m porte plus haut encore des traces d'une englaciation antérieure; un tel niveau est bien marqué à la cote 700 m.

La glaciation alpine a créé, par ses récurrences, un emboîtage d'auges de surcreusement. De telles auges se rencontrent-elles au Groenland? Le problème est important, mais dépassait malheureusement nos possi-

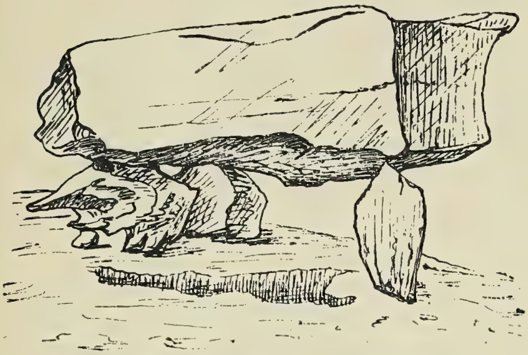


Pavé de dalles soulevées par le gel au Nùnap Kigdlingâ.

Phot. Jost, juillet 1912.

bilités d'étude systématique. J'ai cependant pu reconnaître de telles auges au nombre de deux, aux flancs des montagnes du massif Hjortetakken (vers 800 et 500 m d'altitude), de même dans l'île de Disco entre Skansen et Godhavn.

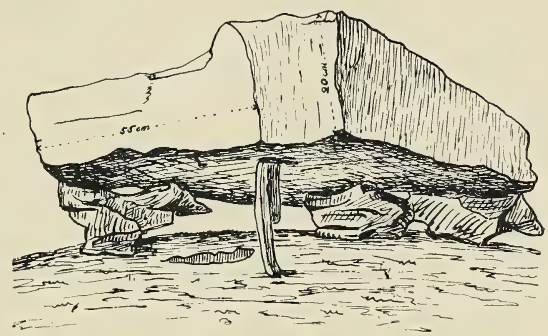
Si les placages continus de moraine profonde sont rares au Nùnap Kigdlingâ, les blocs erratiques y abondent. Il n'est pas de saillie rocheuse



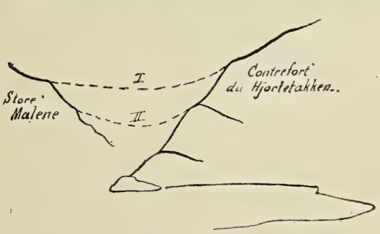
Bloc »perché«. Nùnap Kigdlingâ (vu de côté). Croquis Mercanton 28 VI 1912.

qui n'apparaisse couronné d'une ou plusieurs de ces pierres, profilant sur le ciel leurs contours arrondis. Il faut remarquer en effet que les plus gros blocs ont toujours des arêtes mousses; en outre, ils ne sont jamais énormes, et je n'en ai pas vu dépassant 3 m cube. Les petits blocs anguleuxne sont guère que les restes de pierres plus grosses. Ces contours émoussés s'expliquent par l'origine exclusivement sous-glaciaire des blocs, le lit seul de l'inlandsis pouvant en livrer au grand glacier.

Les facteurs atmosphériques ont en général balayé les menus graviers, les sables et les boues que le glacier avait pu déposer en se retirant, et les gros blocs s'érigent, seuls, sur des plages rocheuses dénudées. Un accident des plus pittoresque se manifeste ainsi fréquemment au Groenland: le gros bloc ne repose pas directement sur la roche en place mais bien par l'intermédiaire d'un ou plusieurs cailloux, de telle sorte qu'on aperçoit le ciel par dessous. La figure reproduit les croquis fidèles que j'ai faits de l'un d'eux, le 28 juin 1912, sur le Nùnap Kigdlingâ, vers 500 m d'altitude: sur une croupe arrondie de schistes noirs polis, une dalle de gneiss de 55 cm de côté et 20 cm d'épaisseur, gris clair, reposait, surélevée en deux points par de petits blocs de schistes et en un troisième par une lame de roche verdâtre verticale. Cette lame n'avait que 20 cm de hauteur, 10 cm de largeur et 2 cm d'épaisseur. L'ensemble était si singulier qu'on hésitera à y voir un phénomèn purement naturel et l'on y suspecterait la main de l'homme, si l'endroit n'était aussi écarté, si les pièges groenlandais n'en



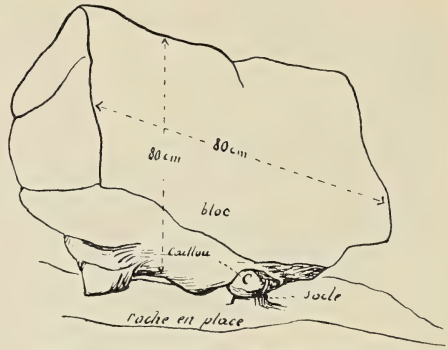
Bloc »perché«. Nùnap Kigdlingâ (vu de face). Croquis Mercanton 28 VI 1912.



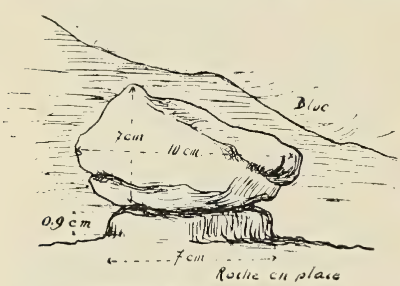
Auges de surcreusement presumées. Mercanton 17 IX 1912.

différaient pas tant et si enfin les exemples de tels écha faudages, véritables »jeux de la Nature«, n'abondaient alentour, non toutefois si audacieux. Je laisse la question ouverte.

Le 16 mai, faisant l'ascension d'un sommet sans nom, haut de quelque 620 m, situé en arrière du Praestfjeld, à environ de 6 km d'Holstensborg, j'ai dessiné le très curieux ensemble de la figure: A 235 m d'altitude, sur une croupe de gneiss moutonnés, un bloc reposait par trois points sur la roche en place, mais pour le troisième, par l'intermédiaire d'un fragment gneissique gros comme le poing. Cette cale, longue de 10 cm, large de 7, et haute d'autant, siégeait elle-même sur une saillie de la roche en place, formant comme un petit socle s'enlevant directement en relief du fond rocheux, avec des côtés verticaux, hauts de 9 mm. On eut dit que le niveau du rocher s'était abaissé de 9 mm, tout autour. C'est là sans doute un effet de la gélivure agissant pendant un temps considérable P.-L. M.



Bloc »perché« près d'Holstensborg.
Croquis Mercanton 16 mai 1912.



Détail du support C.

Le „Mouvement" de l'inlandsis.

A. Le mouvement au front du Nùnap Kigdlingâ (carte à 1:12500).

On a fréquemment mesuré les vitesses d'écoulement de l'inlandsis au front des grands effluents débouchant dans la mer; les énormes vitesses observées ont éveillé une curiosité bien légitime. Toutefois, de telles mesures ne semblent pas pouvoir renseigner sur l'économie, en régime stationnaire, de la gigantesque calotte inlandsisienne. On ne sait en effet, de quelle aire, immense, l'effluent concentre les glaces dans son cours étroit.

En revanche, quand l'inlandsis vient calmement dissiper ses glaces en terre ferme sur un plateau étendu et uni, on est en droit d'admettre que les filets d'écoulement aboutissent normalement au tracé, alors sensiblement rectiligne, du front. Si l'on connaissait la figure et les dimensions exacts de l'inlandsis d'une part et les éléments: mouve-

ment, ablation et pente de la surface d'autre part, pour la partie qui s'étend du front à la limite du névé, (le dissipateur), on pourrait en déduire l'alimentation vraie de l'inlandsis, c'est-à-dire cette portion des précipitations qui, incorporée au glacier, en effectue le »voyage«. En réalité, trop de données nous manquent et peut-être nous manqueront toujours pour autoriser de telles spéculations. L'étude du seul mouvement reste néanmoins d'un intérêt réel.

Nous avons jeté notre dévolu sur cette partie du front de l'inlandsis qui s'étend immédiatement au sud du dépôt III. La crête morainique y culmine à 613 m. En arrière s'étend un inlandsis assez plat, bientôt accidenté pourtant d'un monticule légèrement crevassé. Plus haut, la nappe glacée, après avoir fait terrasse, recommence à s'élever en douces ondulations. Ces parages ne sont pas tout à fait à l'abri des influences de l'Ekip Sermiâ au N et du Sermek Kûjadlek au S, mais nous n'avions pas meilleur choix. D'autre part, le manque de temps et de personnel auxiliaire commandait des précautions spéciales pour assurer aux mensurations une exactitude suffisante.

Je me suis arrêté au parti suivant:

D'une base établie devant l'inlandsis pousser aussi avant que possible sur celui-ci une triangulation dont les sommets, marqués durablement, serviraient de repères du mouvement. Remesurer ce réseau le plus tard possible. Déduire de la déformation intervenue du réseau, les déplacements des dits repères. Compléter ces mesures du mouvement par celles de l'ablation concomitante.

Nous disposions d'un fil d'acier de 48 m, du dynamomètre nécessaire à le tendre et de trépieds pour repérer les portées; du petit théodolite universel d'Hildebrand (30″ à chaque cercle), d'une mire parlante; enfin d'un télémètre à mirage. L'emploi de ce dernier instrument (Barr et Stroud, construction Goerz) combiné avec celui de la boussole nous a permis de dessiner sur le terrain un réseau de triangles à peu près équilatéraux et avec des côtés de 400 m environ.

L'établissement du réseau se fit le 27 juin 1912: malheureusement les bambous fichés à un mètre de profondeur dans la glace pour définir les triangles et mesurer en même temps l'ablation furent, quelques jours après, si malmenés par les rafales de vent et de pluie, que je me résolus à les remplacer par des pierres peintes, mode de repérage moins satisfaisant mais admissible, à la rigueur, sur un glacier plat où le dérapage des cailloux reste faible.

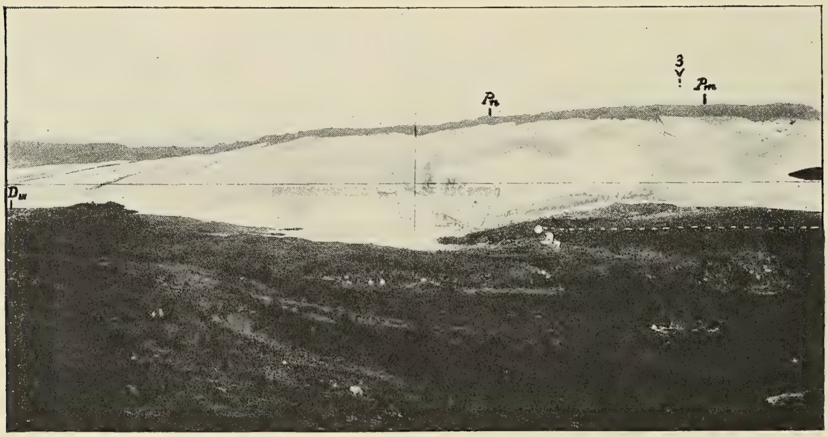
Le réseau se trouva ainsi compter 12 pierres sur la glace propre, la douzième étant à 2,1 km du front. En outre, trois perches P_m, P_n et P_s, fichées sur la crête même de la moraine frontale, devaient à la fois en repérer les déplacements et permettre le raccordement avec la base B_n—B_s. Cette base était définie par des bambous maintenus par

des cairns massifs; sa longueur était 176,42 ± 0,005 m. On la relia en outre trigonométriquement au Frysefjeld et au Søndagsfjeld.

La triangulation initiale du réseau eut lieu, sans interruption, de 13 heures, le 3 juillet, à 4 heures le 4, moment où la pluie vint l'arrêter. La seconde opération se fit les 11 et 12 août.

A côté des pierres 1, 3 et 10, nous avions planté trois bambous, dans des trous verticaux, profonds de 3 m et larges de 4 cm, forés à l'aide d'une barre à mine en frêne, avec tranchant d'acier, attaquant la glace sous une couche d'eau.

Au bout de 39 jours, nous avons retrouvé ces trois perches debout



Le front de l'inlandsis, du Frysefjeld.
Points de départ de la triangulation: à gauche le dépôt III; en face un lagot bordier. Phot. Mercanton 26 VII 1912.

et solidement prises par le bas dans la glace, bien qu'elles baignassent dans des trous coniques de 25 cm de diamètre superficiel pleins d'eau. Le bambou N° 1 était encastré à 0,7 m sous la surface du glacier, et le N° 3 à 1,3 m, le 11 août. Ces perches ont démontré, par surcroît, que les pierres avaient peu divagué: le dérapage n'avait pas excédé quelques décimètres pour les Nos. 1 et 10, et 2 cm seulement pour la pierre N°. 3.

Je ne donnerai ici que les valeurs totales des déplacements, tant verticaux qu'horizontaux, des repères pendant ces 39 jours, puis la vitesse horizontale journalière et les ablations totales. La carte à 1:12500, complètera ce tableau; on y a porté, outre les directions et sens des déplacements horizontaux totaux, les déplacements verticaux corrélatifs (en rabattement). Les valeurs sont consignées dans le tableau avec leur vraie approximation, soit le $^1/_2$ centimètre pour les déplacements totaux et l'ablation et le millimètre pour les vitesses journalières.

Mouvement et ablation de l'inlandsis au Nùnap Kigdlingâ du 3 juillet au 11 août 1912.

Désignation du repère	Altitude en mètres les 3—4 juillet 1912	Distance à la moraine en kilomètres	Déplacement horizontal en mètres en 39 jours	Vitesse horizontale en mètres par jour	Abaissement vertical réel en mètres en 39 jours	Ablation en mètres réduite à 39 jours	Abaissement fictif en mètres en 39 jours (— résurgence)
P_n	607,2	0,0	$0{,}2_5$	$0{,}006_5$	0,2 a	—	—
P_m	. 614,3	0,0	0,4	$0{,}007_5$	$0{,}0_5$	—	—
P_s perche	—	—	—	—	$-0{,}0_5$	—	—
glace	599,9	0,0	$0{,}2_5$	0,006	$0{,}5_5$	0,6	$-0{,}0_5$
1	618,8	0,3	1,2	$0{,}030_5$	1,0	$1{,}2_5$	$-0{,}2_5$
2	649,6	$0{,}6_5$	$2{,}0_5$	$0{,}052_5$	$0{,}9_5$	—	—
3	650,5	0,6	2,0	0,052	1,0	$1{,}2_5$	$-0{,}2_5$
4	630,8	$0{,}4_5$	$1{,}8_5$	0,047	1,1	—	—
5	642,5	0,6	1,8	0,046	1,2	—	—
6	653,8	$0{,}8_5$	1,7	0,044	0,8	—	—
7	657,2	1,1	$2{,}2_5$	0,058	$1{,}1_5$	—	—
8	665,2	$1{,}2_5$	$2{,}2_5$	0,058	$0{,}9_5$	—	—
9	668,4	$1{,}3_5$	2,3	0,059	0,9	—	—
10	673,7	1,6	1,7	0,044	1,1	1,0	0,1
11	671,9	1,7	1,2	0,031	0,8	—	—
12	690,2	2,1	1,6	0,041	1,1	—	—

Ces documents établissent les faits suivants:

a) l'écoulement de l'inlandsis, immédiatement en arrière de la terrasse supérieure du Nùnap Kigdlingâ, a lieu conformément aux prévisions: les lignes de mouvement sont sensiblement normales au front, avec pourtant une légère tendance à dévier vers le sud sous l'influence du Sermerk Kùjadlek; elles restent toutefois à peu près parallèles entre elles.

b) la vitesse de marche horizontale était faible, en été 1912; elle n'atteignait pas même 6 cm par jour au point le plus rapide, le N° 9, à 1,3 km du front. A 300 m de celui-ci, au N°. 1, elle était de 3 cm par jour seulement. La crête morainique elle-même a eu un très léger avancement, n'excédant pas du reste 0,75 cm: jour.

c) ces déplacements horizontaux se sont accompagnés pour tous les repères, cailloux ou perches, de changements de niveau. Sauf pour la perche méridionale de la moraine, P_s, qui aurait subi un exhaussement d'un $^1/_2$ dcm tandis que la surface glaciaire s'abaissait, à son pied, de 0,55 m, la variation de niveau a été partout un abaissement. A cause de l'ablation, les pierres numérotées ont éprouvé, bien entendu, cet abaissement au maximum, mais les perches P_n et P_n, encastrées dans la glace, n'y ont pas échappé non plus: P_n a perdu 0,2 m d'altitude et P_m 0,05 m.

Si les données pour P_s sont correctes, comme je le crois, il y a donc eu affaissement appréciable à l'extrémité N, affaissement léger au milieu et relèvement, léger aussi à l'extrémité sud du segment de moraine considéré. Il convient de remarquer toutefois que les dénivellations de P_m et P_s sont à peine supérieures aux erreurs de mesure possibles.

Si l'on compare les valeurs de l'abaissement des pierres avec celles de l'ablation au point marqué, on voit celle-ci l'emporter presque partout sur celle-là. L'ablation a dissipé plus de glace que l'écoulement n'en pouvait amener. C'est le régime de la décrue, décrue d'ailleurs purement temporaire, à mon sens, et imputable à la seule saison. La petite avance prise par la crête morainique et le fait aussi que le glacier parasite s'est fortement fissuré et a copieusement vêlé, le 28 juillet, dans l'étang situé au-dessous de P , parlerait plutôt en faveur d'une légère crue de l'inlandsis dans ce secteur. Si l'on admet, chose légitime, des ablations de 1,2 m en 39 jours pour les repères on trouve pour eux en général des surrections de 2 à 3 dcm (2,5 dcm en moyenne), soit 2,3 m par an.

La tentation surgit aussitôt d'utiliser cette dernière donnée pour déterminer, au moins approximativement, la position de la limite du névé (Firngrenze) sur l'inlandsis; j'y cède, conscient du risque et, bien entendu, sous toutes réserves: les déplacements horizontaux ayant révélé un écoulement sensiblement perpendiculaire au front et par filets parallèles entre eux, on peut admettre, en première approximation, que leur largeur demeure constante sur toute leur longueur, leurs épaisseurs variant seules. Dès lors, les aires d'intersection d'un filet quelconque avec les surfaces tant du collecteur que du dissipateur, ne sauraient différer entre elles que par leur longueur dans la direction du mouvement glaciaire. Abstraction faite des inclinaisons très faibles de ces surfaces (celle du dissipateur était inférieure à 3° et celle du collecteur négligeable) et en admettant pour tout le dissipateur le même taux moyen de résurgence de la glace, on voit que les deux aires d'aboutissement d'un filet d'écoulement quelconque sont entre elles comme les longueurs des segments dissipateur et collecteur du profil glaciaire.

Ce profil commence au culmen de l'inlandsis soit, d'après les résultats de la traversée, en arrière du Nùnap Kigdlingâ à quelque 440 km du front, et se termine à celui-ci. Les mesures effectuées en cours de route par MM. de Quervain et Fick ont donné pour l'alimentation moyenne, $a_{moy.}$, du côté occidental de la calotte inlandsisienne 0,36 m-d'eau, soit 0,4 m- de glace. Ce serait donc la contre-partie de la résurgence moyenne, $r_{moy.}$, du dissipateur. Dès lors, la longueur cherchée x de ce dernier est déterminée par l'équation:

$$\frac{440-x}{x} = \frac{r_{moy.}}{a_{moy.}}$$

soit pour $r_{moy} = {}^1/_2 \times 2{,}3$ m: an $x = 110$ km
et pour $r_{moy} = {}^2/_3 \times 2{,}3$ m: an $x = 88$ km.

M. de Quervain a rencontré le névé continu à une distance minimum de 80 km du front comptée suivant l'itinéraire, soit de 65 km comptés perpendiculairement au front, mais c'était au début de l'été; il remarque cependant que l'hiver 1911—1912 a été plutôt sec au Groenland.

Remarquons qu'en supposant la limité du névé connue, le calcul fournirait la valeur moyenne de l'alimentation. C'est d'ailleurs plutôt dans ce sens que l'opération paraît devoir être la plus utile, car des mensurations semblables à celle du Nùnap Kigdlingâ combinées avec une randonnée (aèronef!) jusqu'à la limite du névé fourniraient tous les éléments du calcul.

d) Les valeurs trouvées pour l'ablation ne représentent pas, bien entendu, la véritable ablation annuelle. Celle-ci avait commencé son œuvre avant notre arrivée, au début de juin vraisemblablement. Notons que du 29 juin au 1 juillet, le föhn accompagné de pluie, a fondu 19 cm de glace dans la région frontale. L'action destructrice de la pluie est énorme sur le dissipateur inlandsisien, comme d'ailleurs sur tous les glaciers.

e) En combinant pour les repères N° 1 et 3, suivant le mode que j'ai développé dans les Mensurations au Glacier du Rhône, ch. VII, les valeurs corrélatives du déplacement horizontal, de la résurgence et de la pente de la surface glaciaire, on trouve que les filets d'écoulement émergeaient de ladite surface sous un angle de 18°, en (3) 3, et 22° en (1) 1.

Ces angles sont du même ordre de grandeur que ceux que j'ai pu calculer pour la langue terminale du glacier du Rhône[1]).

B. Le mouvement au Sermerk Kùjadlek. — Finsterwalder[2]) a imaginé une très ingénieuse et très simple méthode pour mesurer la vitesse horizontale d'un point quelconque d'un glacier non cartographié. Son principe est que: pour des déplacements du point considéré petits par rapport à ses distances à des points fixes lointains, les angles des lignes de visée de ce point sur ces repères, varient proportionnellement à ses déplacements.

Les indices de crue relevés au Sermerk Kùjadlek démontraient l'opportunité de telles mesures, c'est pourquoi j'ai fait choix de deux points bien représentatifs. Le premier P' était à 360 m d'altitude environ et à 200 m du bord, sur le lobe fronto-marginal médian; le second P'' était juste au-dessus de la cataracte et un peu au midi de son axe longi-

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[1]) Mensurations au glacier du Rhône. Chap. VII. Distribution des filets d'écoulement.

[2]) Zeitschrift für Gletscherkunde, 1911. Vol. V, p. 222.

tudinal, endroit où s'amorçait le régime des crevasses transversales des rapides (545 m).

Le 6 juillet 1912, nous avons marqué P' d'un bambou enfoncé de 3 m dans la glace; puis j'ai fait au théodolite les visées nécessaires sur 4 détails bien reconnaissables des montagnes voisines. Le soir même, nous avons fait en P'' un travail identique. Les mensurations complémentaires ont été faites le 13 août. Bien que la méthode ne situe pas topographiquement les points mensurés, j'ai pu à l'aide de quelques visées supplémentaires localiser P' et P'' sur la carte. Voici maintenant les résultats:

En 38 jours P' s'est déplacé horizontalement de 0,20 mètre par jour. Tandis que l'ablation dégageait 2,0 m du bambou, la surface glaciaire s'est abaissée en réalité de 3,3 m. Ainsi le glacier aurait subi en P' un affaissement de 1,3 m.

P'' le point supérieur a éprouvé dans le même temps un déplacement horizontal de 0,14 m par jour. La surface glacée s'est abaissée de 1,2 m au pied de la perche qui, comme l'autre, était complètement libre dans son alvéole. L'ablation en avait dégagé 1,6 m. Il y a donc eu résurgence de 0,4 m en P''.

C. Le Mouvement de l'Ekip Sermiâ. Nous avons profité de notre séjour à Port-Quervain devant l'Ekip Sermiâ, au commencement d'août, pour y effectuer quelques mensurations par deux procédés, de valeur inégale, mais tous deux suffisants.

Tout d'abord, j'ai braqué successivement un excellent théodolite de Tesdorff sur trois aiguilles de glace remarquables du lobe frontal sud de l'Ekip Sermiâ en face de notre campement. La première baptisée le Cervin (C), dont elle rappelait la forme élancée, se dressait à 400 m en arrière du front, dominant les alentours de ses 60 m d'altitude. La seconde, en façon de tour (T), avait 40 m de hauteur et se trouvait à moins de 50 m de la falaise terminale. La troisième (L), plus lointaine, s'élevait à 45 m au-dessus de la mer et à 300 m du bord. Le télémètre donna respectivement 970, 960 et de 1200 m pour leurs distances au théodolite.

J'ai mesuré les déplacements de ces objets, en azimut et en élévation, par rapport à un repère fixe de la montagne opposée et j'en ai déduit les marches; les déplacements horizontaux ne sont pas, bien entendu, les déplacements totaux mais seulement leurs composantes normales aux lignes de visée; néanmoins, elles ne différaient pas beaucoup des cheminements totaux. L'abaissement comprend l'effet de l'ablation, mais celui-ci n'a pas été notable car la forme des aiguilles, non plus que la tache marquant T, n'ont pas été altérées.

Panorama photogrammètrique de l'Ekip Sermiâ, effluent de l'inlandsis, dans le Nadlùarsùk, Grönland, côte W; lat. N 69° 45; 18—19 avril 1912; alt. du point de vue: 167 m

Phot Mercanton.

Péninsule de Nùgsùak NW Ig

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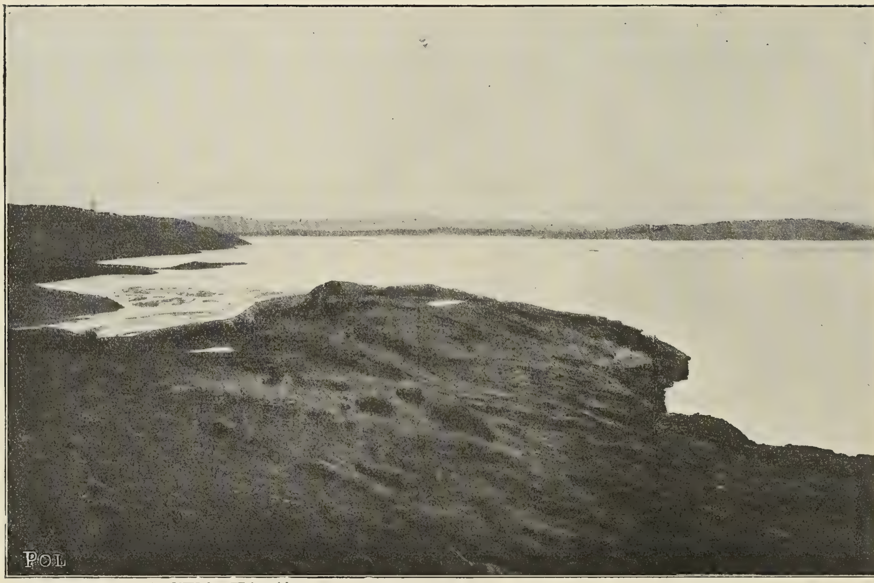


Embouchure de l'Ekip Kúgsúâ.
Au fond: Arveprinsen-Ö

Panorama photogrammètrique d

Le tableau résume les observations:

Objet	Epoque (1912)	Déplacement horizontal total m	Vitesse m : j.	Abaissement total m	Abaissement journalier m
(C) Cervin (sommet)	31 juillet à 10 août	6,9	0,7	0,75	0,08
» » »	10 août à 17 »	6,1	0,85	0,75	0,10
(T) Tour (tache)...	10 » à 17 »	7,5	1,1	0,65	0,095
(L) Sérac	10 » à 17 »	10,7	1,5	2,2	0,32

Il convenait d'obtenir aussi quelques valeurs du mouvement de l'effluent avant son débouché dans le fjord. La vieille moraine qui domine sa rive gauche, près de Port-Quervain, en nous offrant des conditions favorables à l'établissement d'une base, nous a permis de connaître, par deux séries de recoupements à 10 jours d'intervalle, les vitesses de quelques séracs remarquables jalonnant le cours central du glacier. Cette base comportait deux segments rectilignes, mesurés au télémètre avec une exactitude bien suffisante; ils couraient à peu près le long de la crête morainique, reliant trois stations de visée.

Les aiguilles de glace repérées étaient initialement au nombre de cinq, mais le N°. IV s'est effondré en cours de route. Les autres se sont fort bien maintenus pendant les 10 jours séparant les deux mensurations. Voici l'ensemble des résultats:

Objet	Altitude m	Epoque	Déplacement horizontal total m	Vitesse horizontale m : j.	Abaissement total m
A	151	7 août 1912.......	—	—	—
B	185	7 » »	—	—	—
C	283	7 » »	—	—	—
I	318	7 » »	14,6	1,45	0,6
II	315	7 » »	16,0	1,6	0,8
III	314	7 » »	23,4	2,35	0,9
V	295	7 » »	21,5	2,15	—
B(elle) T(our)	167	7 » »	20,2	2,0	0,55

Les vitesses horizontales sont donc du même ordre de grandeur que celles des séracs frontaux. L'anomalie de l'aiguille No. III, réelle. décèle la présence de quelque obstacle sous-glaciaire, qui l'a rejetée hors du droit chemin. Les Nos. I, II et III formaient une file distincte et dominant nettement les aiguilles d'alentour.

Résumé. En résumé, nos mensurations ont décelé les vitesses de marche suivantes pour l'inlandais grœnlandais au Nùnap Kigdlingâ:

Front du Nùnap Kigdlingâ	0,6 à 6	cm : jour
Effluent Sermerk Kùjadlek	14 à 20	—
— Ekip Sermiâ (300 cm d'altitude)	145 à 235	—
— Ekip Sermiâ (front, lobe sud)	70 à 150	—

Remarques complémentaires sur l'ablation.

En rapprochant les valeurs de l'ablation mesurées sur le Sermerk Kùjadlek de celles observées sur l'inlandsis, en arrière de la grande moraine frontale du Nùnap Kigdlingâ, et en les réduisant toutes à 39 jours, on obtient la série suivante, courte mais instructive.

Altitude en mètres	Ablation en 39 j. en mètres du début de juillet à la mi-août
360	2,05
545	1,65
620	1,25
650	1,25
675	1,0

Les perches à 360 et 545 m d'altitude jouaient dans leur trou et en purent être retirées sans peine. En revanche, les perches de l'inlandsis étaient, le 12 août, encore encastrées par leur pied dans la glace où elles s'enfonçaient de 2 m environ; en 3, le trou conique plein d'eau où baignait le bas du bambou était profond de 130 cm, la perche y était donc retenue par 63 cm de glace encore.

Ainsi donc, à la mi-août, l'inlandsis était dégelé au moins jusqu'à 153 cm de profondeur, à l'altitude de 545 m; à celle de 650 m, il ne l'était plus au-dessous de 130 cm. P.-L. M.

Le „Grain" de l'inlandsis.

J'ai profité de notre séjour en marge de l'inlandsis pour faire quelques relevés du grain tant sur le glacier même, au Nùnap Kigdlingâ, que sur des fragments du front de l'Ekip Sermiâ échoués à Port-Quervain. J'utilisais la méthode expéditive de Forel qui consiste à calquer le réseau que dessinent sur une coupe plane de l'agrégat glaciaire les contours des grains, rendus apparents par la fusion.

Deux relevés ont été faits, le 29 juillet 1912, à 300 m au dessus de la grande moraine frontale du Nùnap Kigdlingâ près du repère N° 1, en surface propre. Deux autres ont été obtenus le même jour dans la

Grain de l'inlandsis au Nùnap Kigdlingâ zone à moraine. Échelle 1/2. 29 VII 1912. P.-L. M.

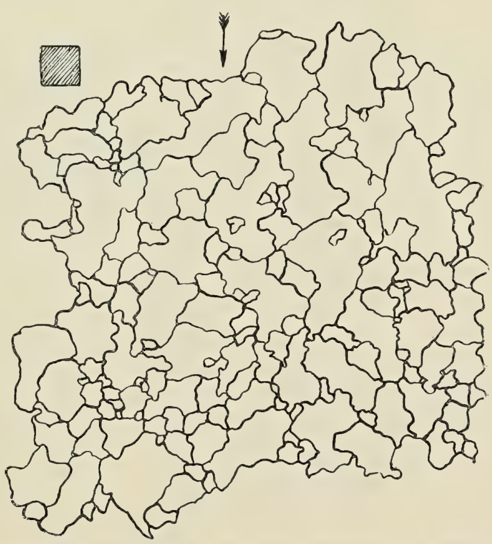
zône sale à une quarantaine de m. en arrière de la crête morainique. Ces 4 relevés sont très semblables d'aspect.

A Port-Quervain même, j'ai pu examiner le grain de trois glaçons provenant du vêlage de l'Ekip Sermiâ. Le premier était à grain relativement petit avec de nombreuses bulles d'air; le second était plus compact et transparent, avec un grain plus gros; enfin le troisième était à gros grain aussi.

Relevé N°	Section moyenne en cm^2	Volume moyen en cm^3
I	2,3	3,0
II	1,3	2,0
III	2,0	3,0
IV	2,6	4,0
V	0,8	0,7
VI	3,3	6,0
VII	2,8	5,0

Le plus gros grain se voyait dans le relevé N°. 4, avec 29,2 cm^2 (150,3 cm^3); un autre (du calque 6) aurait eu 18,2 cm^2 et 80,3 cm^3.

D'une manière générale, nulle part le grain de l'inlandsis ne dépassait les dimensions très modestes que nos mesures indiquent. La durée du „voyage du glacier" ne favorise donc pas l'accroissement du grain autant que le facteur variation de température qui est vraisemblablement, comme Emden l'a montré[1]),



Grain d'un débris de l'Ekip Sermiâ à Port-Quervain. P.-L. M. 15 VIII 1912. Ech. 1/2.

[1]) R. Emden, Über das Gletscherkorn. Publié par la Société Helvétique des Sciences naturelles, 1890.

Grain de l'inlandsis Nùnap Kigdlingâ, glace propre (Echelle 1/2).
29 VII 1922 P.-L. M.

le facteur d'accroissement principal.

Ces relevés de grain ont aussi confirmé l'origine toute éolienne dutalus glacé bordant le front de l'inlandsis au Nùnap Kigdlingâ, en aval de la crête morainique. Le grain devait en être très petit parce que participant de la jeunesse des névés; c'est bien ce qu'à montré l'expérience: le grain n'a qu'une aire moyenne de 0,13 cm^2 correspondant à un volume de 0,05 cm^3. P.-L. M.

La Cryoconite.

A. E. Nordenskjöld, par l'attention qu'il lui a vouée, par l'origine extra-terrestre qu'il lui attribuait, par le nom savant dont il l'a baptisée, a fait la notoriété de cette souillure de l'inlandsis grœnlandais. Fortune exagérée et tôt réduite à sa juste valeur par les nombreuses recherches mêmes que la réputation de la cryoconite a suscitées depuis lors. L'origine cosmique de ces particules minérales n'est plus soutenable, l'examen microscopique ayant révélé leur identité avec les poussières que les vents charrient.

De nombreux minéralogistes ont démontré péremptoirement qu'il s'agit ici essentiellement des détritus pulvérulents de roches archéennes, gneiss, schistes micacés, etc. à l'exclusion apparemment totale de produits volcaniques. Wülfing a cependant signalé la présence dans la masse de sphérules isolées, larges de 0,1 à 0,2 mm, d'origine peut-être extra-terrestre, rares d'ailleurs.

La cryoconite garnit le fond de trous qui criblent littéralement certaines plages du dissipateur inlandsisien d'un réseau serré de tubes cylindriques verticaux. Ces trous ont été trop étudiés pour que nous ayons jugé utile de le faire de nou- veau. Une bonne fortune nous a procuré toutefois une quantité si grande cryoconite qu'on pouvait espérer quelques résultats intéressants de son examen: le 21 juin 1912 en effet, l'itinéraire de la traversée nous a amenés à un objet noir, complètement isolé sur la blancheur des glaces, à 10 km en arrière du Nùnap Kigdlingâ.

Grain du glacier parasite. Nùnap Kigdlingâ. (Échelle 1/2).
30 VII 1912.

Grain d'un débris de l'Ekip Sermia; Port Quervain.
15 VIII 1912. Échelle 1/2.

C'était un cône circulaire, haut d'un mètre, large de 2, formé d'un noyau de glace, recouvert d'une chape de cryoconite durcie. Ce revêtement avait près d'un décimètre d'épaisseur; il s'était craquelé par séchage

Amas de cryoconite sur l'inlandsis à 10 km du Nùnap Kigdlingâ. Phot. de Q. 21 VI 1912.

et sentait le grisou; certaines portions étaient teintées de rouille. Le dit cône se dressait au milieu d'une faible dépression de la surface glaciaire et à quelques mètres de lui un gros ruisseau s'engouffrait dans une crevasse. Sans doute cette bourbe avait été concentrée par le ruis-

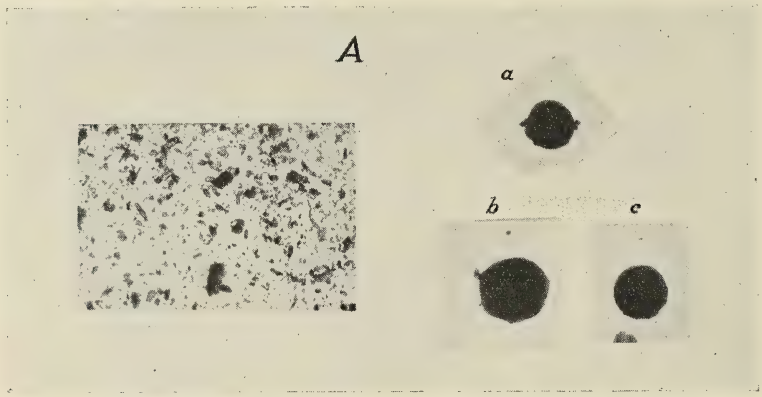
sellement au fond de quelqu'étang, actuellement asséché. Il y avait là près d'un demi-mètre cube de cryoconite et nous avons pu en emporter plusieurs kilogrammes.

Le lendemain j'ai recueilli en outre un petit échantillon de cryoconite à 22 km de la terre ferme, au fond d'un trou plein d'eau. Voici les résultats d'étude de ces masses:

Provenance. Cryoconite N°. 1 du cône à 10 km de la terre ferme; latitude 69°41′ N Long. W Gr. 49°55′, alt. 599 m,

Cryoconite N°. 2, d'un trou à 22 km du front, lat. 69°38′ N long. 49°40′, alt. 960 m.

Aspect. N°. 1. In situ: boue noirâtre sentant le gaz des marais. Détrempée, elle se muait en un limon noir gluant et plastique; séchée



A Cryoconite brute (G = 41 ×). *a, b, c* granules magnétiques (G = 82 ×).

au four, elle devenait gris foncé, grumeleuse, cohérente et ne cédant qu'au choc ou à l'entaille. Elle poudrait les doigts. De 197 grammes essayés 0,1 gr seulement n'a pu traverser le tamis à maille de 0,1 mm. (Dusserre).

N°. 2. idem.

Composition minéralogique. [D'après † le Professeur Sigg et Mlle Carrasco, Université de Lausanne].

N°. 1. Poussière cristalline formée de amphibole, quarz, pyroxène, pyrite, magnétite, fibres incrustées de limonite.

N°. 2. Même composition, mais en outre: amas jaune brun informe de limonite.

La grosseur des particules allait de moins de 1 micron à 150 microns environ.

Cette composition minéralogique fait de ces cryoconites une boue détritique de roches cristallines terrestres, de nature plutôt dioritique. C'est donc originellement un dépôt éolien. Les éléments volcaniques

y font entièrement défaut, ce qui peut s'expliquer aussi par une kaonilisation ultérieure de ceux-ci. Les fibres incrustées de limonite sont vraisemblablement des algues comme de Drygalski en a trouvé au Karajak. Aucune diatomée (Courvoisier).

L'analyse chimique faite par le Dr. Mellet, professeur à l'Université de Lausanne, et qui se rapporte à 100 parties en poids de la substance longtemps étuvée à 120°, indique:

Cryoconite No. 1, analyse qualitative: présence de: silice, alumine, fer, chaux, magnésie, matières organiques azotées, eau de constitution. Traces de métaux alcalins, manganèse, strontium, acide phosphorique.

Cryoconite N° 2: comme le N° 1, mais sans manganèse.

Analyse quantitative: on n'a pas recherché, en détail, les métaux alcalins, présents en assez grande abondance:

Substance	N° I %	N° II %
Silice	60,19	59,57
Alumine	11,89	12,67
Oxyde ferrique	9,93	8,05
Chaux	4,59	5,34
Magnésie	2,95	2,08
Matières organiques et eau de constitution	5,58	5,55

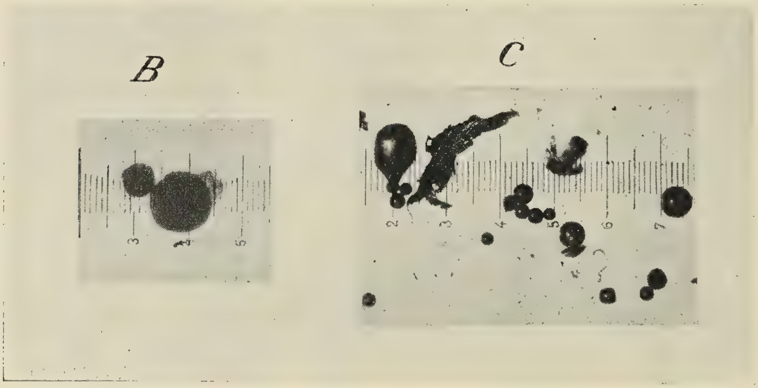
Sans s'abuser sur l'origine manifestement tellurique de la cryoconite, on pouvait se demander si l'amas N° 1, concentration de toute la matière tombée sur un territoire très vaste, ne pourrait renfermer des débris cosmiques analogues à ceux de la «boue rouge» des grands fonds marins. On sait que ce sont principalement des sphérules massifs noirâtres, d'éclat métallique, dont un défoncement circulaire entame la parfaite rotondité. Ces granules ont la composition de météorites holosidères qui auraient subi à leur passage à travers notre atmosphère une fusion presque complète. Subsidiairement on trouve aussi des chondres brunâtres, météoritiques également.

J'ai recherché les particules de la première espèce qui sont attirables à l'aimant. Par ce dernier moyen, j'ai retiré de 693,5 gr de cryoconite N°. 1 en poudre sèche 25,8 gr [3,7 %] de substance que j'ai d'abord léviguée, puis examinée au microscope. J'y ai trouvé 17 granules sphériques ou ovoidaux. Un fort grossissement faisait voir une surface brun-noir, luisante, craquelée et rugueuse. Quelques grains très ronds laissaient nettement discerner la fossette caractéristique des globules de la boue marine. En revanche, un autre grain rond a présenté un appendice cristallin comme de quarz transparent.

Ces sphérules étaient restés aimantés après le tri et tendaient à se rejoindre à travers le baume de Canada de la préparation.

D'après feu Sir John Murray et M. Chumley, du Challenger Office, certaines de ces particules pourraient être d'origine météorique; d'autres ne le sont certainement pas.

M. C. Linder a obtenu les belles micrographies (une division de l'échelle égale 17 microns) de la fig. 00. *Aa* montre un globule dont les pôles magnétiques retiennent des débris; *B* représente deux globules



B = Granule à appendice transparent; diam. 187 μ
C = Battitures de briquet à silex (1 division = 17 μ).
Phot. Linder.

venus en contact [le plus gros porte précisément l'appendice cristallin précité]. Enfin, à titre de comparaison, *C* reproduit l'aspect des granules de fer fondu échappées de l'archaïque briquet à silex. Cette dernière figure est très suggestive: certains de nos grains ressemblent étrangement à ceux-ci. J'ai mesuré les dimensions suivantes des granules:

N° du granule	Forme	Diamètre en microns
I	sphérique	100
II	sphérique, fossette	127
III	sphérique	55
IV	fragment sphérique	76
V	sphérique	106
VI	»	76
VII	»	87
VIII	»	92
IX	ovoïdal	142—157
X	sphérique (appendice)	185—196
XI	sphérique	76
XII	ovoïdal	65—80
XIII	»	71—76
XIV	arrondi	236
XV	ovoïdal	109—120
XVI	»	105—130
XVII	sphérique, fossette	185—195

Diamètre	Nombre
50—99 microns	8 granules
100—149 —	5 »
150—199 »	3 »
200—250 »	1 »

La cryoconite N° 1 n'est pas plus radioactive que la plupart des sédiments et moins que mainte argile issue du granit par décomposition (Gockel et Mercanton). P.-L. M.

Les Glaciers du Blaesedal (Disco).

J'ai profité d'une escale à Godhavn, du 30 août au 6 septembre 1912, pour visiter et mensurer trois glaciers du Blaesedal, appareils de dimensions modestes mais d'un accès assez facile pour qu'on puisse espérer des renseignements un peu fréquents sur leurs variations d'étendue. Deux d'entre eux occupent des vallons du flanc W, assez près de la mer; le troisième descend du flanc E, au N du Skarvefjeld [Ivnarsùak]. Le plus méridional des trois est connu sous le nom de Lyngmarksbrae.

Ces glaciers ont été visités en 1893 et 1894 par Chamberlin[1]) qui les donne comme en état de maximum. MM. Frode Pedersen (aujourd'hui Froda) et Pjetursson ont levé en 1897 une carte détaillée des fronts de ces glaciers[2]).

Le distingué directeur de la Station arctique danoise Magister Porsild m'ayant remis obligeamment copie de leur carte, j'ai pu répéter les mesures des topographes danois. J'ai retrouvé sans peine les cairns marquant les stations de M. Froda et j'y ai répété, le 2 septembre 1912, ces mesures par son procédé. Ce travail d'une rigueur évidemment médiocre a cependant prouvé que depuis 1897 les trois glaciers avaient déjà subi un recul notable. Il se traduisait par les valeurs suivantes:

	Front m	Rive nord m
I Lyngmarksbrae	70	40
II Son voisin septentrional (Gl. Pedersen-Froda)	80	30
III Glacier oriental (Gl. Pjetursson)	40	—

D'ailleurs, en 1897, ils étaient déjà en recul sur 1893 et 1894.

Pour faciliter le contrôle ultérieur du Lyngmarksbrae au moins, j'ai fait le même jour avec l'aide de M. Thorbjørn Porsild un levé photo-

[1]) Glacial Studies in Greenland. I. Journal of Geology, Chicago 1894, Vol. III. p. 774 et suiv.

[2]) Meddelelser om Grønland, Vol. XIV, 1898.

Le Lyngmarksbrae (Disco) du repère A, 2 IX 1912.
Phot. Mercanton.

grammétrique du lobe méridional de ce glacier. La figure reproduit un cliché fait à la Station A, extrêmité d'une base tachymétrique de 106,6 m. Des cairns marquaient ses extrêmités *A* et *B* et les marquent

Le Lyngmarksbrae (Disco) du repère B, 2 IX 1912.
Phot. Mercanton.

aujourd'hui encore sur le terrain. Celui de *A* se dresse sur une saillie rocheuse qu'il surmonte de 95 cm; celui de *B* est constitué par un parallélipipède de basalte simplement posé sur un gros bloc à demi enterré; la base passait par le sommet du cairn *A* et l'arête du parallélipipède *B* qui lui faisait face. Sur ce terrain volcanique, tout emploi de la boussole est illusoire; j'ai donc repéré la direction de la base sur deux points faciles à reconnaître des rives du glacier (Nos. 4 et 5 de la carte). Voici d'ailleurs les quelques données nécessaires à l'emploi de celle-ci et à un levé ultérieur du front:

Repère	Distance horizontale en mètres	Elévation verticale en mètres
Du cairn B on avait:		
A	106,6	14,5
IV	1848,7	256,8
V	1828,2	293,8
Angles: AB-IV 27°14′0; ABV 10°7′0.		
Du cairn A on avait:		
IV	1754,5	—
V	1723,3	—
Angles: BA-IV 151°10′4; BAV 169°17′7.		

Durant l'été 1923, M. Froda a refait ses mesures de 1897 et les miennes[1]): De 1912 à 1923, le lobe méridional s'est raccourci de 10 m environ. D'autre part, M. Froda évalue à 220 m le retrait du Lyngmarksbrae depuis 1897, chiffre qui correspondrait à une accélération quelque peu surprenante du recul, depuis 1912.

Les trois glaciers du Blaesedal ne sont d'ailleurs pas les seuls dans la région dont la diminution au cours de ces dernières années ait été constatée, sinon mesurée. Le catéchiste groenlandais Gerhardt Kleist, dans un mémoire manuscrit intitulé »Kalâdlit nùnatà sermia pivdlùgo agdlagkat« expose, entr'autre, qu'au début de son séjour à Kitsigsùarsùit (Hunde-Eiland), en 1877, il voyait au sommet du Blaafjeld de Disco un petit glacier; en 1884, ce glacier avait disparu. D'autre part, le même observateur établi à Godhavn, a noté depuis 1886 la régression graduelle de la langue glaciaire descendant vers Godhavn même, dans le fond d'un ravin séparant le Lyngmarksfjeld de l'Apostelfjeld à l'endroit nommé Akùarùt de la carte Froda. Le 3 septembre 1912, nous ne vìmes plus de ce glacier qu'un fin liseré blanc se profilant sur le ciel. P.-L. M.

[1]) Cf. Meddelelser om Grønland LIX.

Les Isbergs.

Les isbergs sont bien connus aujourd'hui, quant à leur nature, leur provenance, leur cheminement. Il s'en faut toutefois que l'intérêt du sujet soit épuisé pour le glaciologue. La naissance même de l'isberg, le vêlage du glacier est encore matière à controverse; le processus exact de sa destruction n'a pas été non plus correctement défini encore. C'est pourquoi l'Expédition a voué une attention éveillée aux isbergs qu'elle croisait en route. Nous avons pu examiner entre autres les 8 juin et 25 août les grands isbergs échoués à la sortie du célèbre Isfjord de Jacobshavn.

Les isbergs rencontrés étaient de toutes tailles, allant de la mon-

Isfjord de Jacobshavn, du Koroarsùk (90 m), vers le SE.
Phot. Mercanton 8 VI 1912.

tagne imposante au chétif glaçon flottant. Les grands isbergs étaient naturellement en minorité, parce que le vêlage des effluents de l'inlandsis fournit des masses en majorité restreintes et que les gros isbergs vont se subdivisant avec l'âge. En effet la dérive des isbergs groenlandais, du fond de leurs fjords originels vers le large, est généralement lente et hasardeuse, de sorte que la plupart d'entre eux n'arrivent en pleine mer que fort délabrés déjà. C'est pourquoi les grands isbergs tabulaires sont vraiment rares dans les eaux groenlandaises; la plupart des grandes »montagnes« rencontrées dressaient sur l'eau un hérissement d'aiguilles, de cornes, d'arêtes, bizarrement contournées, ou montraient ces grottes, ces porches majestueux, quel'imagerie a popularisées.

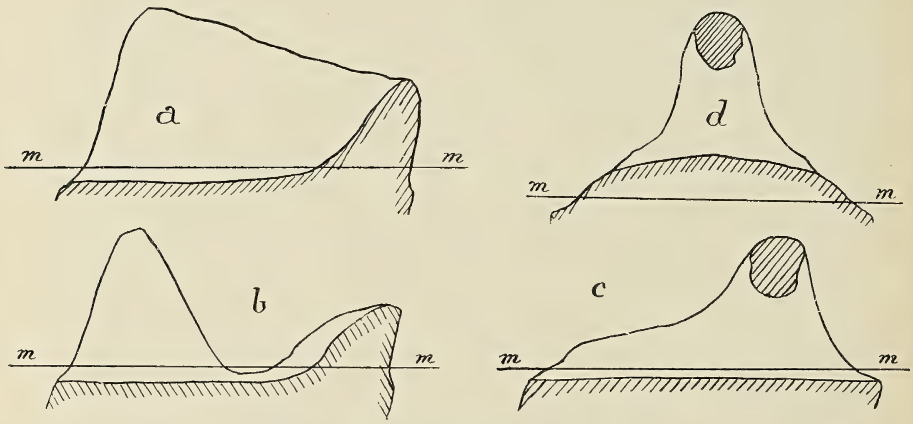
Au premier abord, ces superstructures déconcertent par leur étrangeté, si diverse. A les mieux considérer, je pense qu'elles dérivent toutes de la même entité morphogénique: le tunnel effondré. Les pointe-

Isberg échoué près de Godhavn (Disco). Phot. Jost, au clair de lune, hiver 1912—1913.

ments, les murailles sont les vestiges de galeries taillées par la mer dans le parallèlipipède de glace primitif. Ce mode d'architecture isbergienne se schématise comme suit:

»Une arche plus ou moins grande s'élève sur deux piliers massifs, prolongements aériens de la large base immergée de l'isberg. En règle

générale, cette arche n'est pas au milieu de son socle flottant, mais bien plutôt elle s'érige parallèlement à l'un des flancs de la table primitive, et plus près de son bord, de telle sorte que de ce côté les retombées de l'arche ne font guère que prolonger la face immergée, tandis qu'à l'opposé elles se continuent en deux talus peu inclinés ou même en deux vrais pans de muraille qui se font vis-à-vis en ménageant entre elles et en avant de l'arche une véritable tranchée. Cette tranchée n'est d'ailleurs elle-même que le demeurant du tunnel, dépouillé de sa voûte de proche en proche et dont l'arche est le dernier vestige. Que celle-ci disparaisse à son tour, et l'isberg ne montrera plus, au-dessus de l'eau, que deux murailles vaguement parallèles, bientôt recoupées en aiguilles

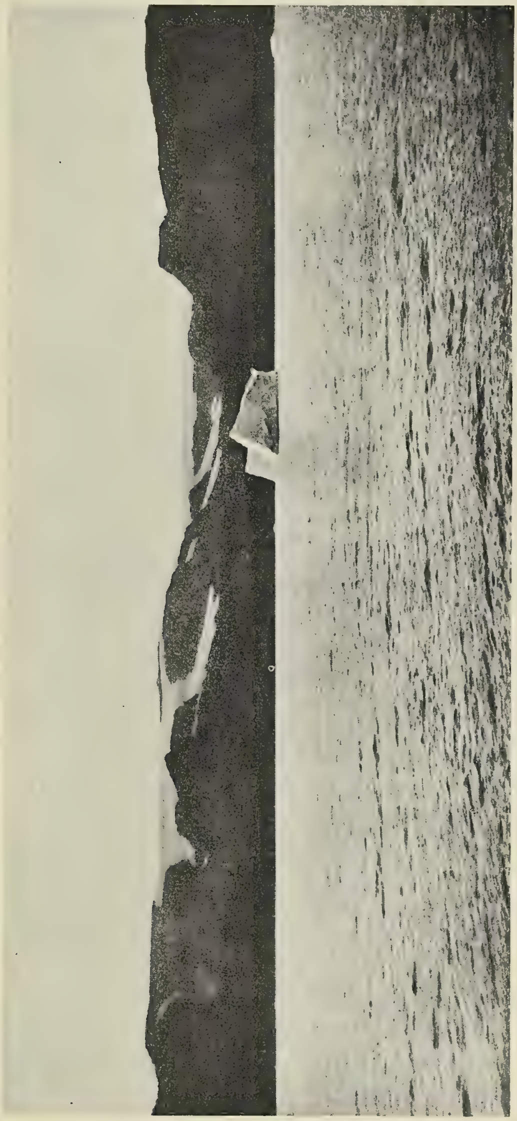


Schèma de la destruction d'un isberg.

par l'attaque latérale des flots. En effet, la vague a davantage d'emprise destructive sur le milieu des parois que sur leurs bords, qu'elle esquive en les contournant«.

N'oublions pas ce fait capital qu'à tout changement de volume de l'isberg correspond pratiquement un déplacement de sa flottaison: quand la voûte d'un tunnel traversant un isberg, vient à disparaître sur une certaine longueur, non seulement la portion émergée du corps flottant en est allégée, mais encore son centre de gravité et son métacentre se déplacent tous deux. L'isberg émerge un peu davantage encore, mais surtout il bascule du côté demeuré le plus lourd, celui de l'arche restante, tandis que les piédroits de la portion de voûte dissipée pointent toujours plus haut vers le ciel. Quand enfin la voûte a entièrement disparu, il ne flotte plus sur la mer que trois, voire quatre pitons de glace aigus, distants mais solidaires les uns des autres, tels les pieds d'une table emportée à la renverse par quelque inondation. Les 4 coupes verticales médianes d'isbergs, *a*, *b*, *c*, *d*, illustrent cet exposé doctrinal. *a*) figure un isberg en amphithéâtre simple; *b*) un dit, mais dont le mur

latéral a été rongé jusqu'au dessous de la flottaison *mm*; *c*) représente un isberg percé d'un tunnel dont la voûte s'est effondrée peu à peu, sauf en une région placée dissymétriquement; *d*) donne le même cas



Isberg en amphithéâtre au large de Skansen. Au fond les montagnes de Disco.
Phot. Mercanton 29 VIII 1912.

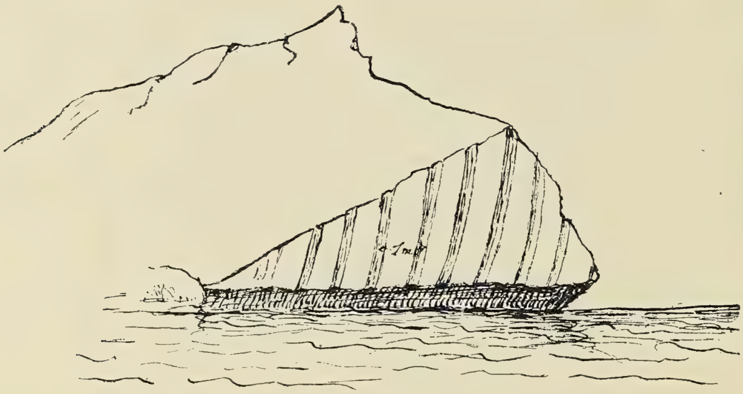
mais symétrique l'allégement de la superstructure ayant en outre déterminé l'exondation totale du tunnel.

D'ailleurs le percement de celui-ci peut n'être pas complet, et la voûte peut même s'être effondrée au fur et à mesure lors du creusement: l'isberg prendra alors l'aspect d'un véritable amphithéâtre flottant.

L'échouage de l'isberg, en supprimant ces chavirages successifs permet le développement de découpures beaucoup plus hardies.

Les isbergs montrent partout à leur surface le travail des agents auxquels ils finiront par succomber. Ces agents sont, pour la partie immergée, le soleil, la pluie, la condensation de la vapeur d'eau atmosphérique, les embruns plus ou moins salés, qui tous provoquent la fusion de la glace, l'évaporation, qui la sublime, enfin la rupture pure et simple des portions de paroi devenues surplombantes et qui s'écaillent, laissant des surfaces de fracture souvent conchoidales.

Au ras de l'eau, c'est l'affouillement par la vague et quand la mer charrie des glaçons, le choc incessant de ceux-ci. Les positions succes-



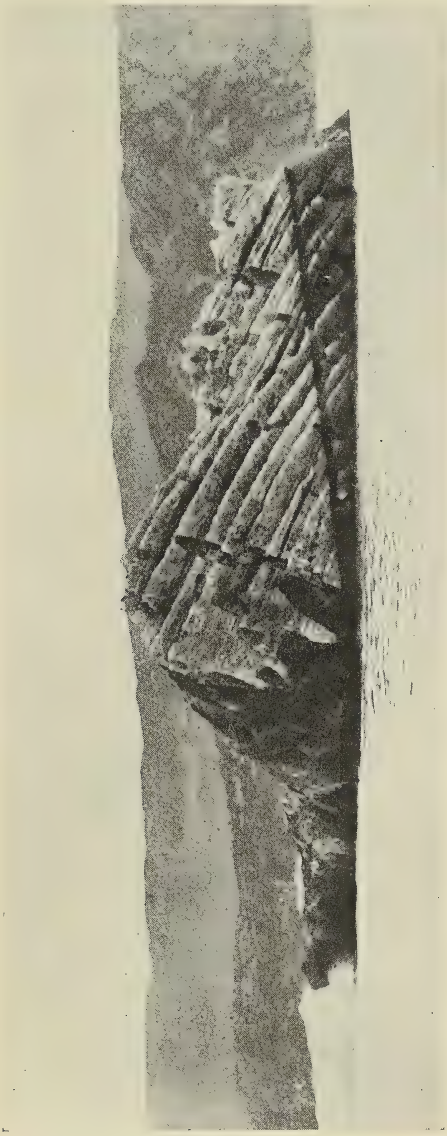
Cannelures d'un isberg près d'Agto.
Croquis de Mercanton 3 VI 1912.

sives de l'isberg sur l'eau se discernent facilement aux rainures, banquettes, alignement de fossettes, voire de petites grottes que la mer y a creusées pendant que la flottaison variait peu; ou encore, quand il émergeait d'un mouvement lent et continu, par des surfaces lissées. L'attaque de la glace par l'eau où elle plonge, se fait dans la règle par une multitude de petits tourbillons de convection qui cisèlent dans la surface un guillochis de facettes concaves, grossièrement hexagonales. J'ai vu dans le Sermilikfjord de Sukkertoppen de petits isbergs, dont les parois immergées étaient criblées de pareilles facettes, larges de 3—4 cm, profondes de quelques millimètres et sans rapport avec le grain glaciaire sousjacent.

A ce mode général de corrosion semble correspondre parfois un processus plus spécial: fréquemment les parois des isbergs se montrent sillonnées de cannelures, dont l'écartement, le relief et la forme sont très réguliers. Le croquis montre de ces sillons, distants d'un mètre environ.

La téléphotographie d'un isberg voguant près d'Atâ, le premier

août 1912, met mieux encore ce phénomène en évidence, en même temps qu'il en éclaire l'origine. Cet isberg était fait de deux sortes de glace. L'une était propre, blanche et rugueuse, comme l'est ordi-



Isberg dans l'Ikerasak d'Atâ. Téléphot. Mercanton 1 VIII 1912.
A gauche glace propre, à droite glace bordière avec débris et cannelures de fusion.

nairement la glace à la surface d'un glacier ensoleillé; l'autre, exceptionnellement transparente, était de couleur vert bouteille et toute souillée de débris terreux. Or une paroi de cette partie était couverte d'un réseau complet de cannelures parallèles. De grandes alvéoles grossièrement elliptiques en gerçaient la surface, sans égard à la direction des

cannelures. Ces trous semblaient être les anciens logements, éventrés par la fonte, de matériaux morainiques, incorporés naguère à la glace et disparus depuis lors: l'isberg avait, de toute évidence, fait partie de la marge sale d'un des grands effluents de l'inlandsis tout proche. Les cannelures ressemblent, trait pour trait, à celles que J. P. Koch et A. Wegener ont observées au Groenland nordoriental, à la paroi glaciaire du Jaettebrinken[1]), ancienne rive de lac; à celles aussi que j'ai signalées au flanc du barrage de glace du lac temporaire de Crête Sèche [Valais] en 1898[2]). Ces sillons procèdent de la convection thermique mais s'exerçant non plus en eau libre sur un glaçon en dérive, mais bien le long d'une paroi de glace immobile dans une eau tranquille.

Durant notre séjour à Port-Quervain nous avons observé la formation de nombreux isbergs, de taille d'ailleurs médiocre, car l'Ekip Sermiâ n'a qu'un écoulement assez lent, et selon toute probabilité ne flotte nulle part. La profondeur de l'eau au pied de sa falaise ne devait guère dépasser 100 m, à Port-Quervain.

Le vêlage était intermittent; à un paroxysme de quelques heures succédaient des journées d'accalmie presque totale, le vêlage intéressant successivement les diverses parties du front, qui a 8 km de développement. Le plus souvent, il y avait écroulement simple dans l'eau des masses déchiquetées du front. Toutefois, le 4 août, Stolberg et moi avons observé l'émergence soudaine, devant la falaise frontale, d'un prisme de glace énorme, lequel parvenu assez haut le long de la muraille s'est renversé et couché sur l'eau. Pareillement le 17 août.

Le 8 août enfin, nous avons vu se détacher une portion de la falaise sur toute la hauteur du front. La portion émergée de ce pilastre de glace avait in situ une hauteur de 30 m, une largeur de 25 et une épaisseur de 7, soit un volume approximatif de 5000 m^3; l'isberg entier en avait vraisemblablement le quadruple. Sa chute dura plusieurs secondes et, fait surprenant, la masse se divisa aussitôt en une véritable poussière de fragments.

Destruction des Isbergs. Un mode méconnu. Des observations, fortuites d'abord, puis systématiques, nous ont remis sur la trace d'un facteur destructif, propre à la glace des isbergs et capable d'expliquer certaine étrangeté de leur désagrégation: parfois la masse glacée semble éclater comme sous l'effort d'une véritable pression interne. Ce phénomène était déjà connu de Barents (1596). et a été observé de près par Nordenskjöld dans le périple de la »Vega«[3]).

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[1]) Koch et Wegener, Die glaziologischen Beobachtungen der Danmark-Expedition. Medd. om Grönl. XLVI, 1911.

[2]) Mercanton, Les débâcles au glacier de Crête-Sèche. Annuaire du Club alpin suisse. 34ième année, p. 265, pl. II.

[3]) Voyage de la Vega, par A.-E. Nordenskjöld (Traduction Rabot et Lallemand, Paris 1883, tome I, p. 378).

Stolberg et de Quervain, naviguant près de Godhavn en mai 1909 ont vu un isberg tabulaire se partager à grand bruit en deux masses presque égales, qui, sans changer de flottaison, se sont lentement écartées l'une de l'autre. Mon propre journal porte, en date du 3 août 1912: »De plus en plus, je remarque que la destruction des petits glaçons est un fait d'éclatement plutôt que de fusion; celle des isbergs aussi: ils tombent en pièces. Je n'en ai pas encore vu chavirer«.

Le 6 août, à marée montante, le chenal de Port-Quervain est rempli de glaces flottantes; je note expressément que par un temps pluvieux et + 4° de température, toute cette glace crépite sans discontinuer comme du verre qui se craquèle.

Le 14 août, j'observe que les nombreux glaçons, restés silencieux pendant la nuit, se mettent à crépiter davantage, surtout les gros, à mesure que la journée s'avance; il fait du soleil, un peu atténué par un fin voile nuageux.

Enfin, à deux reprises, j'ai vu de tout près des esquilles de glace littéralement projetées en l'air à 3 ou 4 décimètres au-dessus de glaçons flottants. Sous le clair soleil, ceux-ci ne cessaient de crépiter.

L'ensemble des observations parle donc en faveur d'une pression interne. D'où peut-elle provenir? Ce ne peut-être de la dilatation due aux rayons solaires: l'observation du 6 août y contredit; non plus que de la salinité d'ailleurs faible de l'eau du fjord: une expérience directe me l'a démontré. Cette pression interne paraît préexister dans la glace de l'isberg. Nordenskjöld l'explique théoriquement par la pression que la glace a subie dans les profondeurs de l'inlandsis, explication générale qui demande d'être précisée. Ces précisions ont été données par Koch et Wegener sous la forme expérimentale. Hivernant à Borg [Groenland NE. lat. 75° N] en 1912—1913, ils ont découvert que les bulles d'air dont la substance de l'inlandsis est pétrie, comme celle de tous les glaciers d'ailleurs, s'y trouvaient sous une pression d'une grandeur imprévue. Ils ont déterminé des surpressions de 10 atmosphères dans des échantillons de glace prélevés à 7 m de profondeur dans l'inlandsis et à quelque —10° de température. Des expériences semblables m'ont donné, au glacier de Saleinaz, en Suisse, des surpressions beaucoup plus faibles, mais il s'agissait de glace de surface, à température près de 0°, dont la plasticité avait déjà sans doute permis la détente. La compression doit en effet se relâcher graduellement quand l'écoulement glaciaire ramène la glace à l'air libre à la périphérie du glacier surtout quand sa température se rapproche de 0°. De nouvelles études sont encore nécessaires pour élucider tout cela.

Il va sans dire que bien des destructions d'isbergs s'expliquent sans qu'on recoure à la notion de pression interne: si un isberg chavire,

certaines de ses parties se trouvent brusquement en porte-à-faux; elles se brisent alors, ce qui entraîne un nouveau chavirage et de nouvelles ruptures. Ainsi l'isberg peut-il être débité très vite en fragments minimes.

Dimensions des Isbergs. Jost et moi, avons mesuré les dimensions des parties émergées des plus gros isbergs rencontrés, tant dans la baie de Disco que dans l'Isfjord de Jakobshavn. Nous utilisions le télémètre à mirage et une jumelle graduée:

Numéro	Longueur en mètres	Largeur en mètres	Hauteur en mètres
I	303	231	23,5
II	281	196	27
III	372	—	51
IV	256	219	50
V	212	172	28
VI	242	—	45
VII	640	585	40
VIII			61,5 et 59
IX	»	»	32
Isfjord de Jakobshavn, 8 Juin 1912:			
X	—	—	65 (max. 75)
XI	—	—	50
XII	—	—	60

P.-L. M.

Septième Section.

Notice archéo-ethnologique.

A. Un tombeau de Kivitok? Le 15 août 1912, nous avons exploré un tombeau découvert par Jost dans les rochers de Port-Quervain, à quelques centaines de mètres du monument du »Fox« et à 30 m environ d'altitude. Les masses rocheuses forment là une série de bandes séparées par d'étroits couloirs où l'on peut passer tout juste entre des parois verticales hautes de deux à trois mètres. Au pied même d'une telle paroi et dans un enfoncement bordant le couloir un squelette s'allongeait. Le roc formait le plafond de son tombeau; le sol du couloir en constituait le plancher; enfin, chose digne d'attention, une levée de petites dalles fermait ce retrait du côté du couloir. Le squelette, extrèmement décomposé, devait être celui d'un adulte.

Sommes-nous là en présence d'un tombeau de kivitok, comme on en a retrouvé, par exemple, dans l'île d'Akûdlek, où vers 1850, un kivitok a été découvert, dormant son dernier sommeil dans le tombeau édifié de ses propres mains, où sentant venir sa fin il s'était emmuré[1])?

B. L'abri sous roche de Kitsermiut. Le 21 août 1912, j'ai fouillé à Kitsermiut, localité abandonnée à l'entrée SE de l'Ikerasak, une sorte d'antre ou d'abri sous roche, aperçu dans une paroi à une vingtaine de mètres au-dessus de la mer. Cette anfractuosité à sol plat, était fermée de tous côtés par la montagne. Elle avait pour plancher un abondant terreau jaunâtre. En retournant ce matériel, j'ai trouvé, vers l'entrée, les cendres d'un ancien foyer et quantité de débris de cuisine [Kjøkkenmødding] parmi lesquels des ossements de phoques, de baleines et un andouiller de jeune renne. Enfin, j'ai eu la bonne fortune d'amener au jour deux objets faits de main d'homme: les restes d'une alène en os, et pièce plus intéressante encore, une incisive de phoque adulte percée de deux trous, sans doute une pièce d'arrimage comme l'Esquimeau en a tant dans son équipement de chasse.

Cet abri aurait-il été peut-être aussi le refuge de quelque kivitok?

P.-L. M.

Notice entomologique.

Moustiques.

Nos premières observations de moustiques datent de l'arrivée à Port-Quervain (69°45′ N). Dès le 11 juin, ils devinrent très gênants là même. Le 12, ils étaient déjà nombreux et voraces à 400 m d'altitude, au voisinage du Tasersùak. Ces deux journées avaient été particulièrement chaudes et ensoleillées. Dès le 22 juin, les moustiques étaient partout sur le Nùnap Kigdlingâ, de la mer à l'inlandsis. Il s'agissait uniquement de »Culicada nigripes« Zett. (groenlandais: ipernak), le moustique classique des régions polaires. Ses essaims devinrent rapidement denses et d'une voracité incroyable. Seule le voile de gaze, soutenu à une certaine distance de la tête par la coiffure et engagé par en bas dans le vêtement constituait une protection efficace; il n'y a pas d'accoutumance aux piqûres possible.

Par le temps calme et chaud, il était extrèmement difficile d'échapper à la poursuite de ces parasites. Les intempéries, brouillard, pluie et vent ne nous débarrassaient du fléau que tout temporairement. L'insecte sait merveilleusement juger de l'instant où il risque d'être emporté par le vent fraîchissant: il vole alors de plus en plus près du sol et finit par se réfugier dans les abris que lui offrent partout plantes et cailloux. Dès que le vent tombe ou que la pluie cesse, il reprend son essor.

La densité des essaims et l'âpreté de leur attaque alla s'affaiblissant avec l'avancement de l'été, mais il y en avait encore à la Station (530 m) le 26 juillet. Ce jour là, nous notâmes l'apparition d'un autre insecte, *Simulium vittatum* Zett. (groenlandais amaulik).

Le premier août, Culicada nigripes abondait encore à Atâ conjointement avec Simulium et piquait encore fortement, mais dès le 3, ils devint moins gênant. Dès le 8, ils devint languissant, n'attaquait que peu et piquait sans vigueur. A la fin d'août, nous n'y faisions plus attention.

Notons encore la récolte, sur un jeune renard polaire (*Canis lagopus*), tué à Port-Quervain et dépouillé peu d'heures après, de puces *Chaettopsylla globiceps* Tschbb.; ces parasites étaient concentrés dans le pelage de la face interne des cuisses de leur hôte. P.-L. M.

Remarques sur la peau et le cheveu des indigènes du Groenland oriental

par le Dr. H. Hoessly. †

Les observations ont été recueillies par MM. HOESSLY et de QUERVAIN; les échantillons récoltés sont conservés à l'université de Zurich.

a) Séries de la peau de la plante des pieds. On a pris des empreintes

de 117 individus de tout âge et de tout sexe par le procédé de SCHLAGINHAUFEN. Classés selon MARTIN (Lehrbuch der Anthropologie), pour les linéaments du gros orteil, on a: Type W: 6 relevés; type A: 51 relevés; B: 8; C: 1; AC: 18; L: 18 (triradius interne seul existant); O: 15 (pas de triradius). Le reste des relevés correspond au type F. Pas de différence d'une côte à l'autre du Groenland. La comparaison avec d'autres races donne:

	Négres	Anglo-Américains	Indiens Mayas	Eskimos
Linéaments tourbillonnaires......	47,8	38	17,8	5,6
— ouverts	13,1	49	80,7	94-95

b) *Empreinte du pied.* Au contraire de l'empreinte européenne et surtout de l'empreinte nègre, celle de l'Eskimo a une forme pseudovarique accentuée. Cela tient probablement à un développement insuffisant du squelette du pied. Le matériel osseux nous a manqué pour le confirmer mais le fait que les Eskimos sont en général de piètres marcheurs parle dans le sens indiqué.

c) *Cheveux.* Les cheveux des Eskimos du Groenland oriental sont raides (Types a à c de Martin) et noir pur dans la grande majorité des cas. La section est circulaire, l'indice 90/100 en moyenne. Le pigment est périphèrique, le centre en étant exempt. Epaisseur moyenné: 0,0787 mm.

En résumé le cheveu eskimo s'apparente du plus près au cheveu mongol.

Crânes du Groenland oriental

par le Dr. H. Hoessly. †

(Résumé d'une étude faite à l'Institut anthropologique de l'Université de Zurich, sous la direction de M. le prof. Dr. SCHLAGINGAUFEN et publiée dans le Vol. LIII des Nouveaux Mémoires de la Soc. Helv. Sc. Nat., 1916).

Les 36 crânes étudiés proviennent d'Angmagsalik (Groenland oriental). Ils ont été recueillis soit dans des sépultures communes soit dans des tombeaux isolés et peuvent être vieux de 100 à 150 ans. Boîte crânienne dolichocéphale prononcée allant jusqu'à l'hyperdolichocéphalie; indice 69,8. Les crânes de ces Eskimos de la côte orientale sont en moyenne plus longs, plus hauts et plus étroits que ceux d'autres Eskimos. Du Groenland oriental à l'Alaska, par le Groenland occidental et le Labrador le crâne devient graduellement plus court, plus bas et plus large. Capacité: 1504 cm pour l'homme, 1263 cm pour la femme. L'os frontal est abrupt; en revanche il est moins bombé que chez le Mongol ou l'Eskimo occidental. Le plan du *foramen magnum* fait avec le plan oculo-auriculaire un angle positif, caractère donc primitif. Forte crête sagittale

(en faîte de toit) puissante *protuberantia occipitalis externa*, lignes temporales remontant haut, *glabella* plate.

La face est de hauteur moyenne, avec tendance à la surélévation (Indice du haut du visage: 54). Le nez est haut et étroit. (Indice nasal: 43,9). L'orbite est mésoconque; son plan est fortement frontal. A remarquer aussi la joue abrupte, massive et mal différentiée ainsi que l'indice crânio-facial extrêmement élevé: 101.

La mâchoire inférieure aussi est massive. Le *ramus mandibularis* est très large et bas. Observé aussi: *trigonum postmolare* et *fossola subspinata.*

Hoessly considère l'Eskimo comme se rattachant latéralement aux Mongols dont il aurait conservé les caractères primitifs relativement purs.

Mesures d'électricité atmosphèrique

par K. Gaule. †

a) *Mesures de dispersion.* Elles ont été faites au moyen d'un électromètre d'Elster et Geitel surmonté d'un corps déperditeur consistant en une tige d'aluminium longue de 60 cm et large de 0,5. L'instrument était un prêt du professeur Gockel, (Fribourg, Suisse), dont les méthodes d'observation et de réduction ont été suivies aussi. Le tableau ci-dessous résume les observations:

Holstensborg				Coeff. de dispersion a +	a —	$q = \frac{a-}{a+}$
25 mai	1912,	18,5^h	à une fenêtre	8,91	12,67	*1,43*
28 —	—	18,0^h	plein air	9,16	9,81	*1,07*
29 —	—	19,3^h	idem	9,37	22,89	*2,45*
15 juin	—	16,5^h	Bivouac à 3 km de la côte W	14,92	25,39	*1,70*
20 —	—	23,5^h	Inlandsis, à 20 km de la côte W	7,69	7,42	*0,97*
22 —	—	10,5^h	Campement 2, dans la tente	2,16	5,42	*2,51*
23 —	—	10,5^h	Campement 3, tente	2,31	2,26	*0,98*
25 —	—	18,0^h	Campement 3, tente	2,23	2,23	*1,00*
27 —	—	18,0^h	Campement 6, devant la tente	6,12	6,62	*1,08*
11 juillet	—	9,8^h	Campement 19, devant la tente	9,59	8,54	*0,89*
19 —	—	16,5^h	Campement 27, devant la tente	6,21	7,65	*1,23*

A remarquer la faible dispersion *dans la tente!* Peut-être faut-il considérer plutôt les dispersions à l'extérieur comme exagérées et cela par un effet photoélectrique du rayonnement intense sur le déperditeur d'aluminium poli.

Malgré la difficulté d'interprétation des résultats obtenus pendant la traversée et la rareté forcée de telles mesures au cours d'une semblable expédition, il n'en reste pas moins intéressant de les avoir recueillies sur ce grand territoire glacé, à 2000 m d'altitude, séparé par des centaines

de km tant de la côte dénudée que de la mer et par des centaines de mètres de glace du sol sous-jacent.

b) Mesure de la radiation pénétrante. Réalisées sur le même territoire si spécial, ces mesures eussent pu décider de l'origine cosmique ou non de la radiation pénétrante car les centaines de mètres d'épaisseur de l'inlandsis doivent arrêter la radiation venant du sous-sol. Malheureusement un accident nous priva de l'instrument nécessaire déjà avant la traversée et les mesures de fortune instituées ultérieurement ne suffisent pas à trancher la question.

Essais de T. S. F.

par P.-L. Mercanton.

Essais de radiotélégraphie. Les longitudes groenlandaises étaient connues de façon très insuffisante et l'incertitude atteignait plusieurs minutes pour le point de départ de la traversée. En 1912 la Tour Eiffel avait déjà institué ses émissions régulières de signaux horaires. Elle les émettait à 0 h $^3/_4$ et 11 h $^3/_4$ (h. Greenwich) en ondes amorties de 2000 mètres. Nous nous sommes proposés de recevoir ces signaux et avons emporté un récepteur à détecteur électrolytique construit à Lausanne par J. Meystre et plusieurs centaines de mètres de fil d'acier recouvert de cuivre pour former l'antenne. Cette antenne unifilaire devait être dressée en l'air par le moyen du ballon ou des cerf-volants de sondages météorologiques. Nous ne pûmes malheureusement jamais lui donner le développement désirable; d'autre part le récepteur, qui avait bien fonctionné en Suisse, doit avoir subi une détérioration en voyage car au retour sa sensibilité était très affaiblie. Enfin le poste de la Tour Eiffel n'avait alors q'une puissance totale de 40 kw et à Holstensborg oú nous essayions d'en capter les signaux il faisait continuellement jour. En outre le terrain gelé rendait malaisé l'établissement d'une terre convenable. Nos tentatives ont donc échoué; une seule fois nous avons cru reconnaître les signaux prémonitoires mais nous n'avons pas pu discerner le point horaire. L'échec de cette tentative, la première du genre au Groenland, n'enlève rien à l'intérêt du problème et c'est pourquoi j'ai cru devoir la rappeler ici. P.-L. M.

VI.

DE ISLANDSKE KURSFORSKRIFTERS SVALBARDE

AF

GUSTAV HOLM

1925

INDHOLD

INDLEDNING

Ved Norges Overtagelse af Spitsbergen er det af den norske Regering fastslaaet, at den officielle Fællesbetegnelse for denne Øgruppe og Bjørneø skal være »Svalbard«.

Navnet Svalbard findes jo flere Steder paa Island[1]), selvfølgelig uden at man derfor mener, at noget af disse Steder skulde være det Svalbard, der er nævnt i de gamle islandske Optegnelser.

Det har naturligvis heller ikke været den norske Regerings Hensigt, at det skal betragtes som en Kendsgerning, at Spitsbergen er opdaget af og har været kendt under Navnet Svalbard af de gamle Nordboer. Dette berettiger de historiske Kilder jo ikke til. Da der imidlertid sikkert er mange, der — fordi man har fastslaaet dette Navn paa Spitsbergen — har faaet den fejlagtige Anskuelse, at det nu maa være bevist, at man her har det Svalbarde, der omtales i de gamle islandske Annaler og i Kursforskrifterne i Landnámabók, vil jeg henlede Opmærksomheden paa, at det Land, der omtales i disse, efter al Sandsynlighed ikke er Spitsbergen, men Grønlands Østkyst ved Scoresby Sund.

Gamle Beretninger.

I det efterfølgende skal jeg efter »Grønlands historiske Mindesmærker«[2]) og Finnur Jónsson's »Landnámabók«[3]) gengive den Omtale Svalbarde (ɔ: den kolde Kyst) faar i de gamle Optegnelser:

Islandske Annaler. — Blandt Islands historiske Skrifter er de i Middelalderen forfattede Annaler af stor Vigtighed. De var for en Del

[1]) Paa islandske Kort og i »Den islandske Lods« findes Navnet flere Steder: Indenfor Sydsiden af Thistilfjördr, Vest for Halvøen Langanes, ligger en Kirke af dette Navn, og tæt ved den udløber en Aa, Svalbardsá. Det højeste og kendeligste Fjeld indenfor Halvøen Langanes hedder Svalbardshnukr og er 738 m højt. En anden Kirke, der hedder Svalbard, ligger paa Østsiden af Eyjafjördr; ud for denne ligger Svalbardseyri.

[2]) Kbhvn. 1838—45.

[3]) Kbhvn. 1900. — Jeg er Professor Finnur Jónsson megen Tak skyldig for flere værdifulde Oplysninger.

en Fortsættelse af Sagaerne. I »Grønl. hist. Mindesm.« er gjort Uddrag af 13 forskellige Annaler; i de 8 af disse omtales Svalbardes Opdagelse.

I Islandske Annaler staar ved Aaret 1194: »Svalbarðs fundr« eller »Svalbarði fundinn«. I en af Annalerne er Opdagelsen sat til Aar 1195[1]).

Sturlubók. — Den ældste Omtale vi har af Svalbarde findes i Indledningen til Landnáma i Sturlubók. Den er oprindelig skrevet af Sturla Thordarson (død 1284) i det 13de Aarhundrede efter en tidligere foreliggende Landnámatekst, som senere er gaaet tabt og som ikke kan være yngre end c. 1230[2]).

»Saa sige kyndige Mænd, at fra Norge fra Stat er der 7 »dægra« Sejlads i Vest til Horn paa Islands Østkyst, men fra Snæfellsnes, hvor Vejen er kortest til Grønland, er der over Havet 4 »dægra« Sejlads mod Vest. Man siger og, at naar man farer fra Bergen ret i Vest til Hvarfet paa Grønland, man da maa sejle 12 Mile Syd for Island. Fra Reykjanes i det sydlige Island er der 5 »dægra« Hav til Jölduhlaup paa Irland [mod Syd, men fra Langanes i det nordlige Island] er der 4 »dægra« Sejlads Nord paa til Svalbarda i Hafsbotn«[3]).

Det indklammede Stykke [ ] er sprunget over i Sturlubók og her tilføjet efter Olaf Tryggvasons Saga[4]). Det anførte Uddrag er iøvrigt saa godt som ordret overensstemmende med denne Sagas Tekst, hvorfor der til denne enten maa være benyttet en anden og bedre Afskrift af Sturlubók, end den vi har, eller den samme oprindelige Landnámatekst som er benyttet af Sturla[5]).

Det ovenstaaende Uddrag af Landnáma gaar — som omtalt i »Grønl. hist. Mindesm.« — ud paa at vise Vejen til Island og Grønland, men tillige at vise Islands Beliggenhed i Forhold til andre Lande, idet den giver Retninger og Afstande fra fire af de vigtigste Pynter paa Island til de efter Forfatterens Formening nærmest liggende Lande.

Imod Øst, Vest og Syd anføres Landenes Navne, men derimod ikke mod Nord; her siger man, at Svalbarde ligger i Hafsbotn, nemlig Enden eller Afslutningen af Havet, ved Isranden Nord for Island. Naar Svalbarde var Scoresby Sund, var det mere betegnende at sige, at det laa i Hafsbotn, end om man havde sagt paa Grønland, især da Strækningen herfra, 70° Br., til Gunbjørnskær (ved Angmagsalik) altid var belemret med Is og derfor aldrig set.

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1) Grønl. hist. Mindesm. III, S. 8.
2) Landnámabók, S. XXXII.
3) ibid. S. 129; Grønl. hist. Mindesm. III, S. 211.
4) ibid. S. 262.
5) ibid. S. XXXIX.

Hauksbók. — Landnáma i Hauksbók, der er skrevet c. 1325, er en Sammenstøbning af to Haandskrifter, nemlig et af Styrmer den Frode (død 1245) og et andet af ovennævnte Sturla. Haukr (død 1334) holder sig særlig til Sturlubók som den oprindeligste. Han har om-

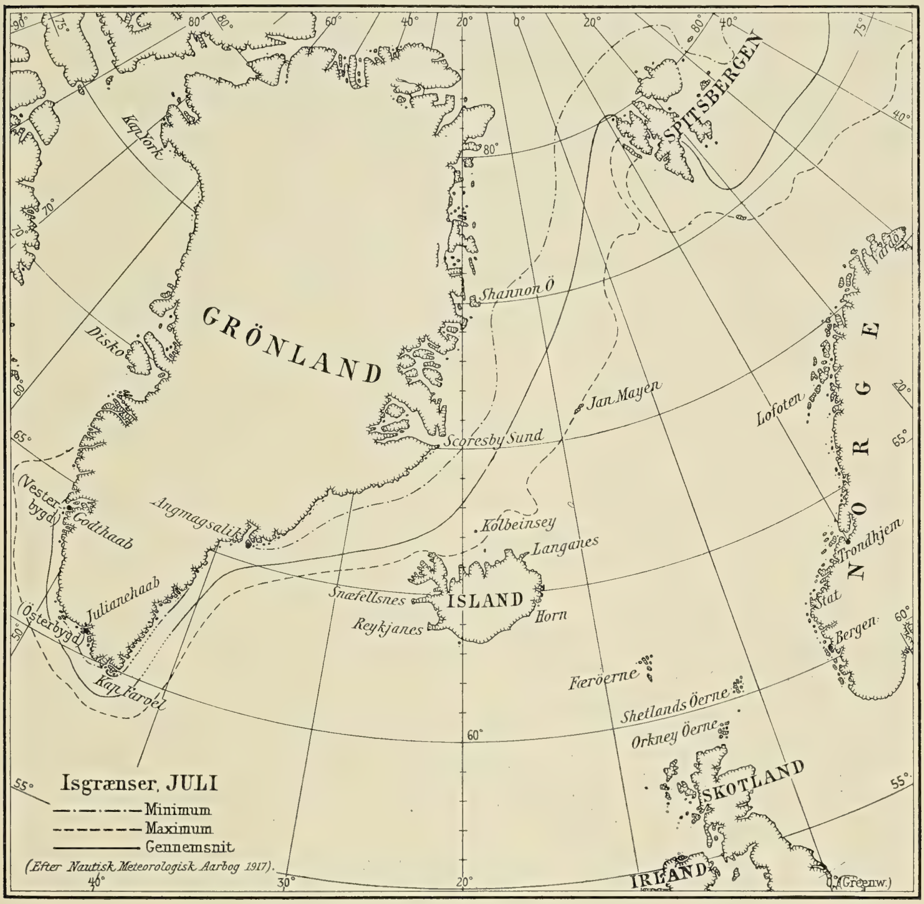

Fig. 1. Gennemsnits-Isgrænse samt Minimums- og Maximums-Isgrænse for Juli efter Observationer 1898—1913. (Nautisk Meteorologisk Aarbog 1917).

arbejdet og udvidet det ovenanførte Stykke fra Sturlubók og giver Oplysninger om Sejladsen saavel til Grønlands Vestkyst (Hvarf) som til den nordlige Østkyst (fra Kolbeinsey). Nogle Enkeltheder har Haukr selv tilføjet[1]).

»Saa sige kyndige Mænd, at fra Norge fra Stat, er der 7 »dægra« Sejlads til Horn paa Islands Østkyst, men fra Snæfellsnes 4 »dægra«

[1]) Finnur Jónsson: »Grønlands gamle Topografi efter Kilderne«, 1898, S. 269 (Medd. om Grønl. XX).

Sejlads til Hvarf paa Grønland. Af Hernum i Norge skal man sejle lige mod Vest til Hvarf paa Grønland; og da sejler man Nord for Hetland, dog saaledes at man netop kan det, fordi man har klar Udsigt over Havet, men Syd for Færøerne, saa at man over Søen kun ser Fjeldenes halve Højde, men saaledes Syd for Island, at dets Søfugle og Hvalfiske lader sig se. Fra Reykjanes paa Islands Sydkyst er der 3 »dægra« Hav til Jöldulaup paa Irland mod Syd, men fra Langanes paa Islands Nordkyst er der 4 »dægra« Hav til Svalbarde nordpaa i Hafsbotn, men en »dægr« Sejlads er der til Grønlands Ubygder fra Kolbeinsey mod Nord«[1]).

Ivar Bårdsön. — Det efterfølgende Uddrag af Ivar Bårdsön's Grønlands Beskrivelse er oprindelig skrevet i Slutningen af det 14. Aarhundrede og er en Oversættelse og ny Bearbejdelse af de gamle Kursforskrifter. Ivar Bårdsön var Præst i Bergens Stift og blev af Biskoppen sendt til Grønland, hvor han var Forstander paa Bispegaarden i en Række Aar[2]).

»Saa sigger vise mend som føde ehre vdj Grønnland, och sist komme aff Grønnland, att norden aff Stad vdj Norge er vij dagge seyling rett vdj vester thill Horns som ligger österst paa Issland.

Item fraa Sneffelznes aff Issland som er stackist till Grønnland 2 dage och thou netters seyling rett i vester att zeylle och da liger Gunbiernershier rett paa mittveyen emellum Grønnland och Issland, thette vaar gammell seylling, en nu er kommen is vdaff landnordenbotne, saa ner forshreffne sher, att ingen vden liffs fare denn gamble leed seyle, som her effter hørres.

Item fraa Langenes som liger øffuerst paa Issland ved fornevnte Hornns ehr ij dagges och ij netters seyling till Sualberde i haffssbaane.

Item de som seyle ville vdaff Bergen rettledess til Grønnland och komme iche till Issland da shulle de zeylle rett vdj vester saa lenge de komme synden ved Issland till Røcheness, och da shulle de verre xij vger søess sønden i haffed af fornevnte Røcheness, och saa med fornevnte vestelede shall hand komme vnder det høye land vdj Grønnland, som heder Huarff . . . .«[3]).

Hertil skal jeg bemærke, at Ivar Bårdsön omtaler Sejladsen til Svalbarde mellem Sejladsen fra Island til Grønland og Sejladsen fra Bergen til Grønland, altsaa som en ret nærliggende Sejlads til Grønland; endvidere at han nævner 2 Dages og 2 Nætters Sejlads[4]) saavel fra Snæ-

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[1]) Grønl. hist. Mindesm. III, S. 213; Landnámabók, S. 4.

[2]) Grønl. hist. Mindesm. III, S. 248 og 887.

[3]) Medd. om Grønl. XX, S. 322.

[4]) Beroer sikkert paa en Misforstaaelse; skal være 4 Døgn (jfr. S. 282 samt H. P. v. Eggers: »Grønlands Østerbygds sande Beliggenhed«. Kbhvn. 1793, S. 12 ff. og Grønl. hist. Mindesm. III, S. 848, Note).

fellsnes til Gunbjørnskær som fra Langanes til Svalbarde, altsaa at Afstanden til Svalbarde er, ligesom i de andre Beretninger, af samme Længde som fra Snæfellsnes Vest paa til Grønland. Afstanden fra Reykjanes til Irland omtales selvfølgelig ikke, da den ligesaa lidt som Afstanden til Spitsbergen vedrører Grønlands-Beskrivelsen.

Grønlands historiske Mindesmærker. — I »Udsigt over Grønlands gamle Geografi« angiver Rafn den rimelige Beliggenhed af de vigtigste Steder i de gamle Beretninger. Han skriver her om Svalbarde[1]):

»Svalbarði í Hafsbotn, den kolde Kyst i Havbugten, som ifølge Annalerne opdagedes 1194, er uden Tvivl den i 1761 af Volkert Bohn fra Østerland Föhr besejlede og senere af Scoresby genopdagede Kyststrækning, af denne benævnt Liverpool Coast, indenfor hvilken der synes at ligge en stor Bugt, hvortil Scoresby's Sund fører. Afstanden af 4 Døgns Sejlads fra Langenæs paa Islands nordøstlige Kyst passer helt vel. I en kortere, dog vistnok urigtigen til een Dagsejlads angiven Distance fra Kolbeinsey, altsaa S. for Svalbarde, laa der Ubygder«.

Kursforskrifternes Vejledning.

Forfattere, der senere har behandlet Spørgsmaalet om Svalbardes Beliggenhed, er kommen til et andet Resultat, nemlig, at der er størst Sandsynlighed for, at de Gamles Svalbarde er Spitsbergen. Dette Emne er behandlet af Gustav Storm i »Ginnungagap«[2]), af Alexander Bugge i »Vore forfædres opdagelsesrejser i Polaregnene«[3]), af Gunnar Isachsen i »Om opdagelsen af Svalbard«[4]), af Fridtjof Nansen i »Nord i Tåkeheimen«[5]), og endelig af Axel Anthon Bjørnbo i »Cartographia Groenlandica«[6]).

Man mener, at Oplysningerne i de gamle Kursforskrifter ikke giver nogen sikker Vejledning til at bestemme Svalbardes Beliggenhed, idet der med Hensyn til Retninger kun gives Hovedretninger Nord, Syd og Vest, men ingen Retninger mellem disse, og at Afstandene er endnu mindre nøjagtige, idet alle Afstandsmaalene er usikre, saa det er haabløst at søge noget System i de forskellige Afstande. Man mener, at Svalbarde snarere maa være Spitsbergen end Østgrønland.

[1]) Grønl. hist. Mindesm. III, S. 846, jfr. Ann. f. nord. Oldk. Kbhvn. 1841, Tav. 1.
[2]) Arkiv for Nord. Filologi, VI, Lund, 1890.
[3]) Kringsjå, XI, Kristiania, 1899.
[4]) Det Norske Geogr. Selskabs Aarb. XVIII, Kristiania, 1906—07.
[5]) Kristiania, 1911.
[6]) Medd. om Grønl. XLVIII, 1912.

Da jeg ikke kan være enig i de udtalte Anskuelser, vil jeg gaa noget nærmere ind paa de gamle Beretninger og begynde med at omtale Afstandene.

Sturlubók (jfr. S. 278). — Fra Stat i Norge til Horn paa Island siger saavel Sturlubók som Hauksbók og Ivar Bårdsön er 7 »dægra« Sejlads. Ordet »dægr«, der i Almindelighed betyder Halvdøgn, har oprindelig været brugt om Dagsejladser under Kystfart, hvor man laa stille om Natten, men maa være gaaet over til at betyde Døgn paa Farten over det aabne Hav, hvor Sejladsen fortsattes uafbrudt. Medens Sturlubók's 7 »dægra« Sejlads fra Stat til Horn hos Ivar Bårdsøn svarer til 7 »dagge« Sejlads, gengives Sturlubók's 4 »dægra« Sejlads fra Snæfellsnes mod Vest til Grønland af Ivar Bårdsøn med »2 dage och thou netters seyling«. Han har altsaa gengivet det første »dægr« ved Dag = Døgn, det andet ved Halvdøgn. Hvis Ivar Bårdsøns Opgivelse var rigtig, vilde Dagsrejsens Længde og Gennemsnitsfarten Vest for Island være dobbelt saa stor som Øst for Island, hvilket de »vise« Mænd umuligt kan have sagt.

Hvis »dægr« oversættes ved »Halvdøgn«, bliver saavel Dagsrejsernes Længde som Gennemsnitsfarten dobbelt saa stor som den, der er angivet i Tabellen. Som man vil se, vilde Farten blive saa stor, at det, for Sturlubók's Vedkommende vilde blive umuligt at kunne udføre Rejsen til Spitsbergen paa det opgivne Antal Dage, og for Hauksbók's Vedkommende vilde det desuden blive umuligt at udføre Rejserne til Hvarf, til Irland og fra Kolbeinsey til Grønland. Farten vilde iøvrigt overalt blive urimelig stor. Kursforskrifternes »dægr« maa man derfor antage betyder »Døgn« og ikke Halvdøgn.

Da Strækningen fra Stat til Horn naturligvis hyppigst har været gennemsejlet af Islænderne, maa Opgivelsen for denne være nøjagtigst. Afstanden er 540 Sømil (se Tabellen), altsaa er en Dagsejlads 77 Sømil (= 143 km) og Gennemsnitsfarten noget over 3 Sømil i Timen. Denne Hastighed for Nordboernes Rejser over det aabne Hav synes meget rimelig og passer godt med tidligere Undersøgelser af Dagsejladsens Størrelse. Rymbegla[1]) opgiver rigtignok 2 Breddegrader (120 Sømil = 222 km) til en Dagsejlads, altsaa 5 Sømil i Timen, men den Fart er formentlig for stor til Gennemsnitshastighed. Storm[2]) siger, at det synes aabenbart, at Dagsrejser altid er regnet for store, eller rettere, at man angav saa faa Dagsrejser, som man under heldigste Forhold ansaa det for muligt at udføre Rejsen paa. Dette passer ikke med den her givne

[1]) Nansen l. c. S. 413.

[2]) »Studier over Vinlandsrejserne«, S. 315 (Aarb. f. nord. Oldk. og Hist., Kbhvn., 1887).

Sturlubók Fra	Til	Antal af Dagsrejser	Afstand i Sømil	Dagsrejsens Længde i Sømil	Gennemsnitsfart Sømil i Timen	
Stat	Horn	7	540	77	3.2	[1]) Til Jan Mayen eller Scoresby Sund.
Snæfellsnes	Vest t. Grønl.	4	300	75	3.2	[2]) Til Spitsbergen.
Reykjanes	Irland, Nord	5	660	132	5.5	
Langanes	Svalbarde	4	300[1])	75	3.2	
			840[2])	210	8.7	

Hauksbók Fra	Til	Antal af Dagsrejser	Afstand i Sømil	Dagsrejsens Længde i Sømil	Gennemsnitsfart Sømil i Timen	
Stat	Horn	7	540	77	3.2	[1]) Til Kap Farvel.
Snæfellsnes	Hvarf	4	630[1])	157	6.5	[2]) Til Jan Mayen eller Scoresby Sund.
Reykjanes	Irland, Nord	3	660	220	9.2	[3]) Til Spitsbergen.
Langanes	Svalbarde	4	300[2])	75	3.2	[4]) Til Scoresby Sund.
			840[3])	210	8.7	
Kolbeinsey	Nord t. Grønl.	1	200[4])	200	8.3	

Beretning. Bjørnbo[1]) omtaler, at Sejladshastigheden ved Korsfarerflaaderne i Aarene 1147, 1189 og 1217 opviser daglige Gennemsnit paa mellem 100 og 200 km; Kålund[2]) angiver efter en islandsk Ledetraad for Pilgrimme, at Dagsrejsens Længde i Middelhavet var mellem 135 og 190 km, altsaa stemmende med den her fundne, nemlig 143 km for Kursforskrifterne i Landnámabók.

Derefter skrives i Sturlubók, at fra Snæfellsnes Vest paa til Grønland, hvor Vejen er kortest, er der 4 Døgns Sejlads. Da Afstanden til Erik den Rødes Ø, Øst for Angmagsalik, er 300 Sømil, bliver Dagsejladsen 75 Sømil, der altsaa stemmer med den foregaaende. Da der ogsaa er 4 Døgns Sejlads fra Langanes til Svalbarde i Hafsbotn, er denne Afstand formentlig ogsaa omtrent 300 Sømil.

Fra Reykjanes til Irland, siger Sturlubók, er 5 Døgns Sejlads i Syd. Da Afstanden er 660 Sømil, bliver Dagsejladsen 132 Sømil, altsaa en Gennemsnitsfart af $5^1/_2$ Sømil i Timen, hvilket sikkert er mere, end man kunde regne med i de Tider. Naar denne Rute er taget med i Indledningen til Landnáma, skønt Islænderne kun forholdsvis sjeldent og

[1]) »Adam af Bremens Nordensopfattelse«, S. 135 Note. (Aarb. f. nord. Oldk. og Hist. 1909).

[3]) »En islandsk Vejviser for Pilgrimme fra 12. Århundrede«, S. 102 (Aarb. f nord. Oldk. og Hist., 1913).

under gunstige Vejrforhold kan have benyttet den, er det muligvis især for at angive Islands Beliggenhed i Forhold til Irland.

Afstandsmaalene i Landnámabók, der er benyttet til Teksten i Sturlubók, er efter min Mening sikre og giver god Vejledning; anderledes forholder det sig med den omarbejdede og udvidede Tekst i Hauksbók.

Hauksbók (jfr. S. 279). — Afstanden fra Stat til Horn, der er i Overensstemmelse med Sturlubók's, er nævnt foran, men dermed hører ogsaa Overensstemmelsen op. Det angives derefter, at fra Snæfellsnes er 4 Døgns Sejlads til Hvarf paa Grønland. Ifølge Sturlubók's og Ivar Bårdsön's Kursforskrifter gaar Sejladsen fra Snæfellsnes ikke til Hvarf, men mod Vest, hvor Vejen er kortest til Grønland. Hvis de 4 Døgns Sejlads skulde forstaas til Hvarf, vilde Dagsejladsen blive dobbelt saa stor Vest for Island som Øst for Island og Gennemsnitshastigheden urimelig stor, selv om man ved Hvarf vilde forstaa Kap Farvel (se Tabellen).

Den næste Afstandsopgivelse er fra Reykjanes til Irlands Nordkyst, der angives til 3 Døgns Sejlads. Afstanden er, som foran nævnt, 660 Sømil, Dagsrejsen altsaa 220 Sømil. Det er højst usandsynligt, at Nordboerne nogensinde har foretaget denne Rejse med saa stor Hastighed, nemlig med en Gennemsnitsfart af over 9 Sømil i Timen.

Hauksbók har — ligesom Sturlubók og Ivar Bårdsön — det samme Antal Dagsrejser fra Langanes til Svalbarde som fra Snæfellsnes til Grønland.

Endelig berettes, at der fra Kolbeinsey (Mevenklint) er 1 Døgns Sejlads mod Nord til Grønlands Ubygder.

Kolbeinsey er en c. 300 m lang og 30 à 60 m bred Klippe, der er 11 m høj over Havet og ligger 40 Sømil NNV. for Grimsey[1]). Den maa vel være opdaget paa Rejsen mellem Islands Nordkyst og Grønlands Østkyst.

Den korteste Afstand fra Kolbeinsey til Grønland, 180 Sømil, er mod NV.; Afstanden til Scoresby Sund er 200 Sømil, hvilket giver en Gennemsnitshastighed af over 8 Sømil i Timen, som i al Fald kun har kunnet udføres en enkelt Gang. Omtalen af Kolbeinsey findes hverken i Sturlubók eller hos Ivar Bårdsön. At denne lille isolerede Klippe er taget til Udgangspunkt i Kursforskrifterne er jo ganske urimeligt. Der bør derfor ligesaa lidt tages Hensyn til den som til Omtalen af 3 Døgns Sejlads til Irland eller 4 Døgns Sejlads til Hvarf paa Grønland, hvilke Oplysninger sikkert ikke falder ind under den oprindelige Landnáma-

[1]) »Den islandske Lods«, 1917, S. 137.

tekst, hvad »kyndige Mænd« har sagt, men under Enkeltheder, som Finnur Jónsson omtaler[1]), at Haukr selv har tilføjet.

Resultatet af denne Undersøgelse om Afstandene er, at alle tre Beretninger er enige om, at der fra Stat i Norge til Horn paa Island — 540 Sømil — er 7 Døgns Sejlads, samt, at der fra Snæfellsnes i vestlig Retning til Grønland bruges samme Antal Døgns Sejlads som fra Langanes til Svalbarde. Sturlubók og Hauksbók angiver dette Antal Døgn til 4, saa at disse Afstande bliver c. 300 Sømil[2]). Denne Afstand er der fra Snæfellsnes mod Vest til Erik den Rødes Ø, Øst for Angmagsalik, og fra Langanes mod NNØ. til Jan Mayen og mod NNV. til Scoresby Sund.

Svalbarde = Spitsbergen? — Med Hensyn til Retningen fra Langanes til Svalbarde er der kun det at sige, at Kursforskrifterne kun angiver de fire Hovedretninger og ingen Retninger mellem disse. Naar der siges, at fra Langanes er der 4 Døgns Sejlads Nord paa til Svalbarde i Hafsbotn, ligger Retningen altsaa mellem NØ. og NV.

Flere af de Forfattere, der kommer til det Resultat, at det er sandsynligst, at Spitsbergen er Svalbarde, fremhæver, at naar de »kyndige Mænd« har valgt Islands Nordøstpynt, Langanes, der gaar i nordøstlig Retning, til Udgangspunkt, synes det bestemt at tyde paa, at Svalbarde maa søges i den Retning[3]). Afstanden til Jan Mayen vilde have passet godt, men man mener dog, at denne Ø ikke kan være Svalbarde, fordi den har saa lille Udstrækning, at man vanskelig kan tænke sig, at Opdagelsen af den skulde blive noteret som Opdagelse af nyt Land. Man antager derfor, at Spitsbergen maa være Svalbarde.

Jeg skal dertil bemærke, at hvis de »kyndige Mænd« har villet angive Sejladsen fra Island til Grønlands Østkyst ved Scoresby Sund Egnen, har de ikke kunnet vælge et bedre Sted til Udgangspunkt end Nordøstpynten af Island. Hvis man havde valgt Nordvestpynten, kunde man sikkert kun meget sjeldent derfra sejle Nord paa lige imod og gennem den mægtige Drivis for at naa Kysten, men maatte først staa Øst paa for at gaa uden om Isen. Dette undgaas fra Langanes, hvorfra Vejen gaar Nord paa og derefter tværs paa Land gennem Drivisen (se Fig. 1).

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[1]) Medd. om Grønl. XX, S. 269. — Isachsen siger (l. c. S. 12), at Finnur Jónsson tvivler paa, at Svalbarde skulde ligge paa Grønlands Østkyst, fordi han i det her nævnte Arbejde ikke omtaler Svalbarde. Dette er en Misforstaaelse, thi Svalbarde laa ganske udenfor det Maal, Forfatteren her havde sat sig. Han skriver derimod i Landnámabók 1900 i Registret over Stednavne, Side 316: »Svalbarði, vistnok et nordligt Sted på Grønlands Østkyst«.

[2]) Om det er Døgn eller Halvdøgn har jo i denne Forbindelse ingen Betydning, da Dagsrejsens Længde her er ligegyldig. Det kommer kun an paa Forholdet 7 til 4.

[3]) Isachsen l. c. S. 13. Nansen l. c. S. 413. Bjørnbo: Cart. Groenl. S. 8.

Afstanden fra Langanes til Spitsbergen er 840 Sømil, der, hvis Spitsbergen var Svalbarde, skulde gennemsejles paa 4 Dagsrejser. Storm antager, som omtalt foran, at man i Almindelighed angav saa faa Dagsrejser, som man ansaa det for muligt under heldigste Forhold at gennemsejle Strækningen paa. I Overensstemmelse hermed udtaler Isachsen[1]), at de 4 Døgns Sejlads til Svalbarde maa forklares saaledes, at et Skib i Aaret 1194, der er gaaet ud fra Islands Nordkyst for at sejle til Norge, er blevet overfaldet af en stærk Sydveststorm, saa at det har været nødvendigt at bære af for Vejret. 4 Døgns Sejlads med gennemsnitlig 9 Knobs Fart vilde saa have bragt det til Spitsbergen.

Dette stemmer med, at der i Historia Norvegiae fortælles, »at mellem Bjarmeland og Grønland er et Land, hvor Sømænd, som fra Island skulde sejle tilbage til Norge, har landet og fundet »homines miræ magnitudinis«, eller at dette Land er fuldt af Is og sender store Isbjerge ud i Havet til stor Fare for Sømænd, som fra Norge skal rejse til Grønland«[2]). I en lignende Fortælling staar, »da nogle Søfolk havde villet sejle tilbage fra Island til Norge, og da de var blevet drevet til de nordlige Strøg af Modvindenes Hvirvel, saa landede de endelig mellem Grønlændingene og Bjarmer, hvor de paastod, at de havde fundet mærkelig store Mennesker og Jomfruernes Land (virginum terram), som skal undfange, naar de smager Vand. Men fra disse adskilles Grønland ved isklædte Skær (scopulis)«[3]).

Naar Spitsbergen, som antydet i Historia Norvegiae, var opdaget af stormdrevne Søfolk, vilde Kendskaben til dette Land, mener Nansen[4]), ikke ophøre med dette Besøg, thi Omtalen i Landnámabók kan tyde paa, at man ofte sejlede derhen og drev Fangst langs Kanten af Storisen Nord efter. Naar man i Juli følger Iskanten, hvor der er en stor Mængde af de værdifulde Hvalrosser, kommer man ufejlbarligt til Spitsbergen. Man vil derimod ikke kunne komme til Grønlands nordlige Østkyst, uden at vove sig langt ind gennem Isen, og det er det ikke sandsynligt, at de gamle Nordboer vilde have gjort, medmindre de havde vidst, om der derinde var Land og følgelig Fangst at vente.

Jeg skal dertil føje nogle Bemærkninger:

Da Navnet Svalbarde ikke nævnes i de ovennævnte Fortællinger i Historia Norvegiae, kan man gaa ud fra, at selv om det ukendte Land, disse Søfolk kom til, var Spitsbergen, var det ikke det i Landnámabók af »kyndige Mænd« omtalte Svalbarde. Jeg benægter nemlig selvfølgelig

[1]) l. c. S. 16.
[2]) Storm: Ginnungagap S. 344.
[3]) Nansen l. c. S. 411.
[4]) ibid. S. 414.

ikke Muligheden af, at Nordboerne — som antaget af Bjørnbo[1]) — i Middelalderen lejlighedsvis skulde have besøgt Spitsbergen, men kun at dette Land er de islandske Kursforskrifters Svalbarde[2]).

Var Landet kun set en enkelt Gang, vilde det sikkert ikke være omtalt i Landnámabók mellem de sædvanlige Sejlruter, end mindre vilde det være nævnt i Ivar Bårdsön's Grønlands-Beskrivelse staaende mellem Kurser fra Island til Grønlands Bygd og fra Bergen til samme. Sidstnævnte Beretning — af »vise mend som føde ehre udi Grønnland, och sist komme aff Grønnland« — har jo ikke medtaget andre uvedkommende Kursforskrifter saasom de urigtige Afstande fra Island til Irland og fra Kolbeinsey til Grønland. En Rute fra Langanes til Spitsbergen vedrørte jo ikke Grønland i ringeste Maade (se S. 280).

Hvis Islænderne derimod ofte sejlede til Spitsbergen og drev Sæl- og Hvalrosjagt langs Iskanten, vilde de »kyndige« og »vise« Mænd sikkert ikke gentage, at det gennemsnitlige Antal Dagsrejser dertil var ligesaa mange som mod Vest til Grønland, nemlig 4, thi de har jo dog fra Island saavel mod Øst som mod Vest angivet Gennemsnitsantallet af Dagsrejser og ikke saa faa Dagsrejser, som disse Strækninger under hurtigst mulige Forhold kunde udføres paa.

Jeg er ganske enig i Udtalelserne om, at der ikke er megen Rimelighed for, at Islænderne har givet den lille Ø Jan Mayen Navnet Svalbarde[3]).

Jeg kommer endelig til Udtalelsen om, at man ved at følge Kanten af Drivisen Nord efter ufejlbarligt kommer til Spitsbergen, men at man ikke vilde kunne komme til Grønlands nordlige Østkyst uden at vove sig langt ind gennem Isen, hvilket de gamle Nordboer ikke vilde have gjort, medmindre de havde Vished for, at der var Land og følgelig Fangst at vente. Det er sikkert rigtigt nok, men Farvandet ud for Scoresby Sund kan være fuldstændig frit for Drivis; det var det i Eftersommeren 1925, og har formentlig været det i det Aar Svalbarde blev opdaget, 1194. Inde i Sundet har Folkene da fundet et rigt Dyreliv af Hvalros, Narhval og Isbjørn, hvilke alle er Dyr, der var meget værdifulde for Nordboerne. De har derfor højst sandsynligt gentaget Besøgene aarligt,

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[1]) Medd. om Grønl. XLVIII, S. 84.

[2]) Navnet Svalbarde er omtalt i Samson Fagres Saga (Grønl. hist. Mindesm. III, S. 524). I et Kapitel med Overskrift »Om nordiske Landes Beliggenhed« skrives: »Risaland ligger mod Øst og Nord for Østersøen, og mod Nordost derfra ligger det Land, som kaldes Jøtunheim, hvor Trolde og Uvætter bo, men derfra, lige til Grønlands Ubygder, gaar det Land som kaldes Svalbarde; der er forskellige Folk . . . .«. Denne Saga (fra det 14. eller 15. Aarh.) betegnes som en »aabenbar romantisk Digtning«.

[3]) Medd. om Grønl. XLVIII, S. 84. Nansen l. c. S. 414. Isachsen l. c. S. 13.

indtil Pakisen er bleven dem for besværlig, eller Dyrene er aftaget i Mængde. Landet er derefter gaaet fuldstændigt i Glemme. Jeg kan slutte mig til følgende Udtalelse: »Selv om Isforholdene paa Grønlands Østkyst i ældre Tider ikke har været bedre end nu, vilde vistnok vore Forfædre ikke have betænkt sig paa at lægge gennem den spredte Drivis for at naa Kysten, hvis Maalet maatte have været denne«[1]).

Resultatet af dette Afsnit er altsaa: Det er ganske naturligt, paa Grund af Drivisens Forekomst ud for Grønlands Østkyst, at angive Ruten til Scoresby Sund fra Islands Nordøstpynt. Farvandet ud for Scoresby Sund kan være fuldstændig frit for Drivis. Spitsbergen kan ikke være Svalbarde, thi var det kun et enkelt Besøg, der var gjort, vilde det ikke være omtalt i Beretningerne; foretoges der derimod ofte Fangstrejser dertil, vilde der ikke i Beretningerne være opgivet, at der til at gennemsejle de 840 Sømil brugtes 4 Dagsrejser. Ivar Bårdsøn, hvis Beskrivelse kun omfatter selve Grønland og Sejladsen dertil, vilde ikke have omtalt Sejladsen til Spitsbergen, da dette Land jo var Grønland ganske uvedkommende.

Gamle Kort.

Nordboerne havde den Anskuelse, at Grønland hang sammen med Fastlandet. Denne Forbindelse tænkte man sig gik fra det kendte Bjarmeland Nord om Havet Nord for Norge til den kendte Del af Grønlands Østkyst. Da man overalt i nordlige Retninger traf paa Drivis, som afgrænsede Havet, kaldtes dette Ishavet, og Afslutningen deraf for Hafsbotn. Da man nu opdagede Svalbarde (Landet ved Scoresby Sund), der laa inden for Isranden ved Havets Afslutning, faldt det af sig selv at sige, at det laa i Hafsbotn, ligesom man vilde have sagt det om Jan Mayen eller Spitsbergen.

De Oplysninger vi kan faa om Svalbarde af gamle Kort er meget sparsomme. Jeg skal her omtale nogle af disse Kort.

Claudius Clavus' Kort.

Paa Fillastre's Kopi fra 1427 af Claudius Clavus' første Kort (Nancykortet) ses den ældste kendte Fremstilling af Grønlands Østkyst (Fig. 2). Originalkortet fra c. 1424 kendes ifølge Bjørnbo ikke[2]). I den latinske Tekst, der hører til Nancykortet, staar i Oversættelse angaaende Grønlands Beliggenhed, at dets sydligste Del ligger under 63°15′ N. Br.,

[1]) Isachsen l. c. S. 11.
[2]) Medd. om Grønl. XLVIII, S. 90.

Fig. 2. Nancykortet. Fillastre's Kopi fra 1427 af Claudius Clavus' første Kort. (Bjørnbo: »Cartographia Groenlandica«, S. 91 [Medd. om Grønl. XLVIII]).

»Dets første Forbjerg« paa 65° Br., »Dets andet Forbjerg« paa 68° Br., og »Dets tredie Forbjerg« paa 71° Br. »Men fra dette Forbjerg mod Øst strækker der sig et uhyre Land lige til Rusland . . .«[1]).

Nord for det nordøstlige Forbjerg paa Island ses paa dette Kort en stor flad Bugt, der kaldes Nordbonden, som afsluttes mod Syd af et særlig mærket, fremspringende Punkt paa 71° Br. (efter Breddegraderne paa Kortets venstre Rand), nemlig det Sted, der i Clavus' Tekst kaldes »Dets tredie Forbjerg«.

Bjørnbo skriver[2]), at den vigtigste og tilforladeligste Kilde, som ligger til Grund for Clavus' Grønlandsfremstilling, er de gamle grønlandske Kursforskrifter. Han paaviser, at Kursforskriften fra Stat i Norge til Horn paa Islands Østkyst passer præcis med Nancykortet; fra Snæfellsnes mod Vest til nærmeste Punkt paa Grønland passer atter; at man fra Bergen til Hvarf paa Grønland kommer tæt Syd for Island passer atter, og endelig, at man fra Langanes mod Nord kommer til den kolde Kyst i Nordbonden. Han siger derefter, at »fraset selve Vejlængderne, som ikke passer, er der altsaa en næsten exakt Overensstemmelse mellem Kursforskrifterne og Clavus' ældre Værk«.

En vigtig Oplysning vedrørende Vejlængderne giver dog dette Kort, og det er Kursforskrifternes Vejlængde til Svalbarde. Man ser nemlig, at Afstanden paa Kortet fra Islands Vestkyst (Snæfellsnes) til det nærmeste Punkt mod Vest paa Grønland, nemlig til Clavus' »Dets første Forbjerg« paa 65° Br., er ligesaa stor som Afstanden fra det nordøstlige Punkt paa Island (Langanes) mod NV. t. N. til Clavus' »Dets tredie Forbjerg« paa 71° Br. De Kilder Clavus her har benyttet, stemmer altsaa med Oplysningerne i Kursforskrifterne.

Germanus' Kopi fra c. 1467 af Clavus' yngre Kort er en løst henkastet Skitse i trapezformet Projektion (Fig. 3). Paa Grønlands Østkyst, Nord for Island, er der paa c. 68° Br. et Forbjerg — svarende til »Dets tredie Forbjerg« paa Clavus' første Kort — som paa Kortet kaldes »ther pmo«. Vest for dette staar Navnet »bour f« i Bunden af Bugten. Sydligere paa samme Kyst, Vest for Island paa $66^1/_2$° Br., findes de samme to Navne igen. Disse er, som paavist af Bjørnbo og Petersen[3]), de to første Ord i Folkeviseverset: »Der boer en Mand i en Grønlands Aa o. s. v.«.

Paa Martellus' Kopi fra c. 1490 af Clavus' yngre Kort[4]) staar

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[1]) Medd. om Grønl. XLVIII, S. 92.

[2]) ibid. S. 100.

[3]) A. A. Bjørnbo & Carl S. Petersen: Fyenboen Cl. Claussøn Svart. (Vid. Selsk. Skr. hist.-filos. Klasse VI, 2. Kbhvn. 1904).

[4]) Medd. om Grønl. XLVIII, S. 104.

Fig. 3. Germanus' Kopi af Clavus' yngre Kort fra c. 1467. (Bjørnbo: »Cartographia Groenlandica«, S. 132 [Medd. om Grønl. XLVIII]).

Navnene »ther pmo« og »beuer fluy« Vest for Island og Nord for Polarcirklen, svarende til de sydligste to Navne paa det foregaaende Kort.

Mercator's Kort.

Paa Gemma Frisius-Mercator Globe c. 1537[1]) og paa Mercator's Globe fra 1541[2]) staar Navnene »thor fl« og »boer fl« paa to Floder paa Grønlands Kyst Nord for Island paa c. 70° Br. Saavel paa det sidstnævnte Kort som paa Mercator's Kort fra 1554[3]) staar Ordet »Screlinger« tæt Øst for »Thor flu«.

Paa Mercator's Kort 1569 (Fig. 4) er paa Grønlands Østkyst c. 4 Breddegrader Nord for Langanes — altsaa paa $70^1/_2$° Br. — tegnet et større Sund og en Række Smaaøer (ligesom paa 73° Br. paa Zeno-Kortet, hvor Folkeviseversets to første Navne ogsaa er anbragt). Paa Landet indenfor Sundet staar Ordet »Screlingers« mellem Navnene »Ther promont« og »Bour flu«. Bredden passer med Scoresby Sund, der som bekendt tidligere har haft en stor eskimoisk Bebyggelse. Ryder fandt her 1891—92 50 Husruiner[4]).

Folkeviseversets to første Navne har altsaa holdt sig paa Kortene i Hundrede Aar omtrent paa samme Sted, og nu er Ordet »Screlingers« kommet til at staa paa Strækningen mellem dem.

Skønt Spitsbergen blev opdaget 1596 af Willem Barents paa dennes 3die Rejse for at søge Nordostpassagen til Kina, og det første Kort, hvori denne ny Opdagelse var fremstillet — nemlig Lindschoten's »Navigatio ac Itinerarium«, Amsterdam — udkom 1599, fremkom der formentlig ingen Bemærkning fra Island om, at det var det gamle Svalbarde, der var genopdaget, og ingen Antydning af Spitsbergen findes paa de islandske Kort. Ganske vist vilde Spitsbergen falde udenfor Rammerne af disse Kort, men hvis Islænderne havde ment, at det var det gamle Svalbarde — hvor man finder det sandsynligt, at der i gamle Dage blev drevet en rig Hvalrosfangst — der var genopdaget, vilde det sikkert være kommet frem paa en eller anden Maade.

Det tidligste Kort, hvorpaa jeg har set Navnet Svalbarde, er paa Jón Gudmundsson's (født 1574)[5]). I Havet tæt Syd for Grønlands Kyst paa c. 70° Br. staar »Hafsbonderne id est, finis Svalbardæ«. Denne An-

[1]) Medd. om Grønl. XLVIII, Tavle IV.
[2]) ibid. S. 285.
[3]) ibid. S. 324.
[4]) Medd. om Grønl. XVII, S. 286.
[5]) Nansen l. c. S. 315.

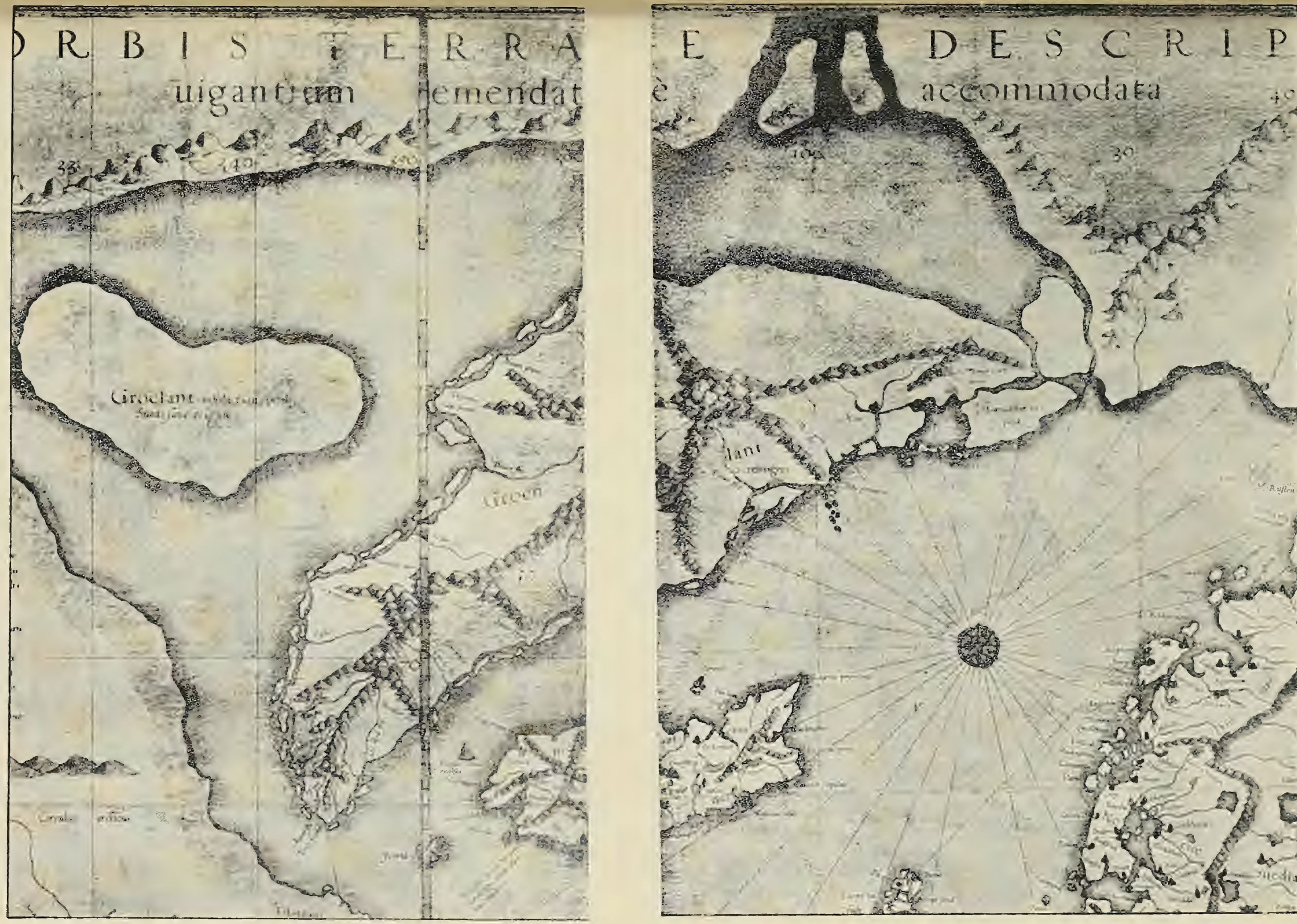

Fig. 4. Mercator's Kort fra 1569. (Bjørnbo: »Cartographia Groenlandica«, S. 325 [Medd. om Grønl. XLVIII]).

bringelse af Navnet i Havet synes at være i Overensstemmelse med Omtalen af Svalbarde i Peder Claussøn's Uddrag af Kongespejlet (Speculum Regale) i »Norriges Bescriffuelse«[1]):

»Vdi samme Haff driffuer ocsaa offuermaade megen Iis langt ud paa Sommeren / oc besynderlig Øster oc Nordost ud ved Landet / huilcken Iis kommer ud aff Sualdbarden / det er / aff Nordbotnen / eller den store Viig / som er bond oc ende paa dette store Norderhaff / som er imellem Norrig / Rysland / Island oc Grønland / . . . .«.

Denne Beskrivelse af Isens Oprindelse fra Svalbarde omtales ikke i det Uddrag af Kongespejlet, der findes i Grønl. hist. Mindesm. III, S. 317, og passer jo ikke med de gamle Kursforskrifter.

Det bemærkes, at sydligere paa Østkysten staar paa Gudmundsson's Kort Navnet »Greipar« (jfr. S. 296).

Thord Thorlacius' Kort.

Paa Biskop Thord Thorlacius' Kort fra 1668—69 (Fig. 5) er Nord for 70° Br. paa Grønlands Østkyst skrevet følgende Legende (8) paa Latin[2]):

»Denne Strækning af Grønland kaldte de gamle for Sualbarde, hvilket Ord betegner en kold Kyststrækning eller Landkant; hele denne Egn er opfyldt med vidtstrakte Bjerge, dækkede med evig Sne, og Kysten er aldrig isfri«.

Her er altsaa en bestemt Udtalelse om Beliggenheden af de Gamles Svalbarde, som jo passer med Scoresby Sund. Den sidste Sætning i Legenden er betegnende for Isforholdene i dette Farvand, som, skønt til Tider kan befares uden Forulempelse af Drivis, dog formentlig sjeldent er ganske isfrit.

Angaaende den Bredde, hvorpaa Thorlacius har anbragt Svalbarde, skriver han[3]):

»Anbelangendes Distancen mellem Island og Grønland, da formeldes der at være fra Snefjeldsnæs til Blaaserk to Dages og to Nætters Sejlads[4]), der er 48 Uger Søes eller 60 tyske Mil, efter som de Gamle holdt en Dags og en Nats Sejlads at være 24 Uger Søes eller 30 M le. Desligeste

[1]) Kiöbenhaffn, 1632, S. 180.

[2]) Medd. om Grønl. IX, Tavle 7 og S. 51: »Latus hoc Grønlandiæ veteres Sualbarda apellabant, qvæ vox latus vel marginem frigidum denotat, totus hic tractus montibus abundat editissimis perpetua nive tectis Litori autem glacies continue adhæret«. — De citerede tre Legender er godhedsfuldt oversatte af Adjunkt Johannes Knudsen.

[3]) Medd. om Grønl. IX, S. 19.

[4]) Fejlagtig i Stedet for 4 Døgn. Th. Th.'s Kilde har formentlig været Ivar Bårdsøn's Beretning (jfr. S. 280, Note).

Fig. 5. Thord Thorlacius' Kort fra 1668—69. (K. J. V. Steenstrup: »Om Østerbygden«, Tavle 7 og S. 50 [Medd. om Grønl. IX]).

fra Langenæs til Svalbard holdte de at være 48 Uger Søes, hvorudaf man kan ungefær slutte, hvad for en Latitudinem Svalbarde haver; thi efter den Regning skal den være 4 Grader Nord for Langenæs«.

Da Langanes ligger paa c. $66^1/_2°$ Br., vil Thorlacius' Svalbarde komme til at ligge paa $70^1/_2°$ Br.

I Havet Øst for Svalbarde har Thorlacius indtegnet »Insulæ Johannis Maijen« (Jan Mayen) med omtrentlig rigtig Beliggenhed. Denne Ø blev første Gang set af Hudson 1607, altsaa efter Spitsbergens Opdagelse.

Sydligere paa Kortet, Nord for 68° Br., staar en anden Legende (7), saalydende:

»Denne mægtige Indbøjning af Grønland kaldte de gamle Trollebotne efter de Kæmper, som de troede havde Bolig her; den er ligesom et Ophobningssted for den Drivis, som nordlige Vinde ofte fører fra denne Kyst ned til Sydgrønland og Island«.

Ogsaa her er Slutningen betegnende. Som bekendt er den omtalte Kyststrækning — saa vidt man ved — altid blokeret af svær Is, og er kun med stort Besvær befaret een Gang, nemlig i Aaret 1900 af nuværende Admiral Amdrup, der kortlagde Kysten[1]).

Rigtigheden af Legenden, der staar endnu sydligere paa Kysten, nemlig paa 67° Br. (6), er derimod tvivlsom. Den lyder saaledes:

»Ved denne Kyst drev de gamle Grønlændere Fiskeri, men kun i Sommertiden; ved Efteraarstid drog de straks hjem igen«.

Det er rigtigt, at der i den paagældende Egn, ved Kialinek, er et rigt Dyreliv i Havet. Angmagsalikerne drager derfor ofte derop især paa Narhvalfangst. Men da der paa Thorlacius' Kort ved Kysten paa dette Sted staar Navnet Greipar, er det sandsynligt, at det beror paa en Fejltagelse, at Legenden er kommen til at staa paa Østkysten i Stedet for paa Vestkysten. Greipar, hvortil Nordboerne drog op for Fiskeriets og Jagtens Skyld, maa jo nemlig, ifølge andre Beretninger, søges paa Grønlands Vestkyst. Muligvis har Legenden og Navnet Greipar gjort Følgeskab med Østerbygden, der her paa Kortet, som bekendt fejlagtigt, er anbragt paa den sydlige Del af Østkysten.

Man vil bemærke, at Thorlacius paa Kortet 1668—69 efter gamle Beretninger faar Svalbarde til at ligge paa samme Bredde paa Grønlands Kyst, hvor der paa Mercator's Kort fra 1569 findes Paaskriften: »Screlingers«. Dette Ord staar mellem de to første Navne af Clavus' Folkevisevers paa Kortet fra 1467, medens Clavus paa det første Kort fra 1427 — der som Kilde har de grønlandske Kursforskrifter — paa samme Sted har »Dets tredie Forbjerg«.

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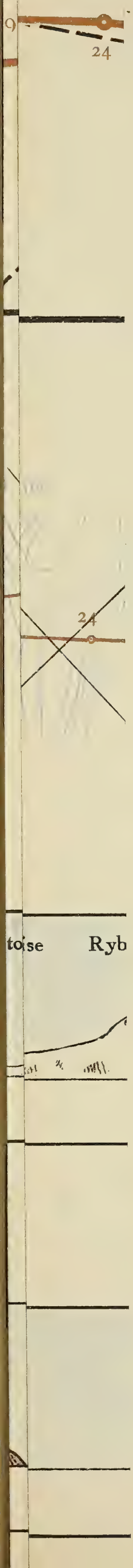
[1]) Medd. om Grønl. XXVII.

Efter de gamle Kursforskrifter har altsaa saavel Clavus — paa det første Kort fra 1427 — som Thorlacius — paa Kortet fra 1668-69 — anbragt det nordligste af de i Kursforskrifterne nævnte Punkter, Svalbarde, omtrent paa samme Sted paa Grønlands Kyst. De har begge været paa det rene med, at Afstanden fra Langanes til Svalbarde skulde være ligesaa lang som fra Snæfellsnes mod Vest til Grønland, og at Svalbarde derfor maatte ligge paa 70°—71° nordlig Bredde.

Slutning.

1) Den ældste Beretning vi har om Kursforskrifterne i Indledningen til Landnámabók findes i Sturlubók. Alle Oplysninger om Kursforskrifterne i denne Bog er tilforladelige og gode. 2) Beregnes Dagsrejsens Længde efter de udløbne Strækninger over Havet saavel Øst som Vest for Island, og efter det Antal Døgn, som efter Kursforskrifterne bruges til at gennemsejle dem, er der fuldstændig Overensstemmelse. 3) Fra Langanes til Svalbarde skal der være samme Afstand som Vest for Island — nemlig fra Snæfellsnes mod Vest, hvor Vejen er kortest til Grønland — altsaa 300 Sømil. Denne Afstand er der fra Langanes i nordlig Retning til Jan Mayen og til Scoresby Sund. 4) Udgangspunktet for Kursanvisning til Scoresby Sund er, paa Grund af Isforholdene, naturligere fra Islands NØ.-Pynt end fra NV.-Pynten. 5) Farvandet ud for Scoresby Sund kan til Tider være fuldstændig frit for Drivis; Sundet har et rigt Dyreliv, og har tidligere været beboet. 6) Spitsbergen kan paa Grund af den fjerne Beliggenhed ikke være Kursforskrifternes Svalbarde; Ivar Bårdsøn vilde ikke have omtalt Sejladsen dertil, da denne jo ikke vedrører Grønlands-Beskrivelsen. 7) Paa Thord Thorlacius' Kort, der — ligesom Claudius Clavus' Kort — har de gamle Kursforskrifter til Kilde, lægges Svalbarde paa Grønlands Østkyst paa Scoresby Sunds Bredde, og i Havet Øst for Grønland lægges Jan Mayen.

Idet jeg fuldstændig kan slutte mig til den af Rafn i »Grønlands historiske Mindesmærker« angivne Beliggenhed af Svalbarde, nemlig Grønlands Østkyst ved Scoresby Sund, skal jeg bemærke, at Spitsbergen formentlig ikke har mere Forbindelse med Kursforskrifternes Svalbarde end Thule Distriktet paa Grønlands Nordvestkyst har med Oldtidens Thule.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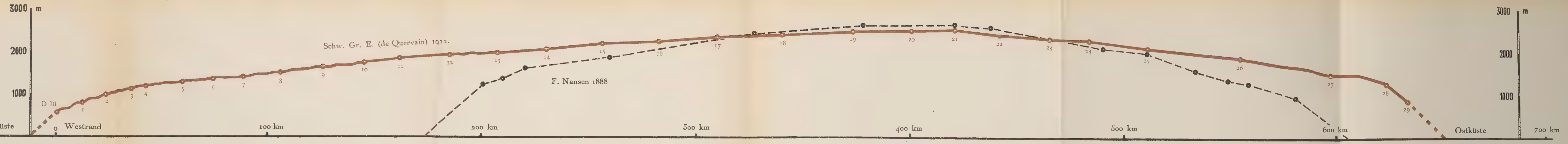
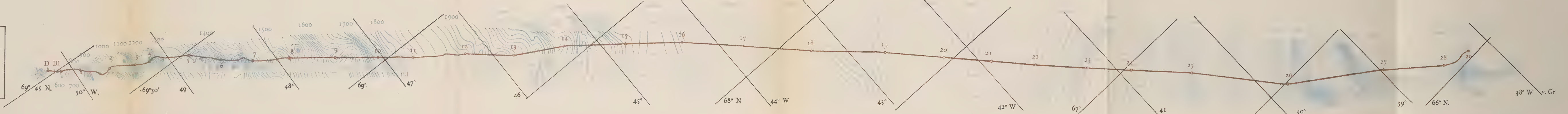
1

Höhenprofil der Grönlanddurchquerung der Schweizerischen Expedition 1912—1913
Construiert von A. de Quervain.
Längenmasstab 1:1,000,000. Höhe 1:50,000.
Die Kreise und Nummern entsprechen den Zeltplätzen.
Als Vergleich F. Nansens Inlandeisprofil 1888.



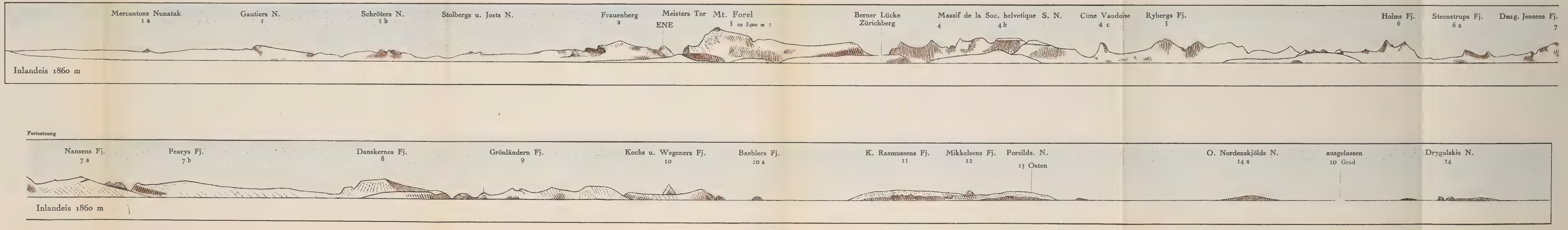
2

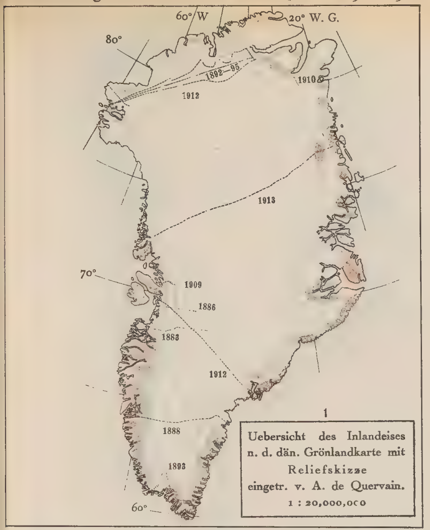
Durchquerungsitinerar.
Darstellung der angenäherten Oberfläche durch ein Isohypsenband.
Constr. u. gez. von A. de Quervain 1914.
Masstab 1:1,000,000.
Aequidistanz 10 m (Randgebiet 50 u. 100 m)

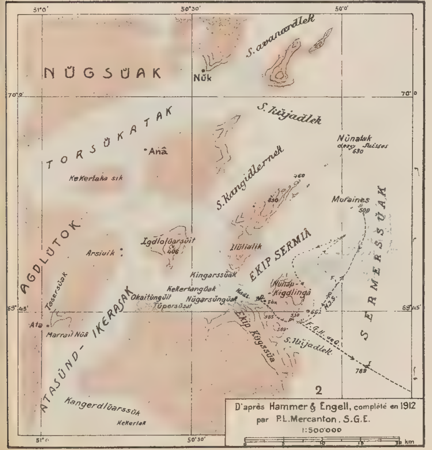


3

Panorama des „Schweizerlandes"
(Ostgrönland)
Vom Inlandeisplatz 26 (66°29'9 N. 39°43'9 W) nach ENE-ESE gesehen.
Aufgenommen von A. de Quervain 17. Juli 1912.



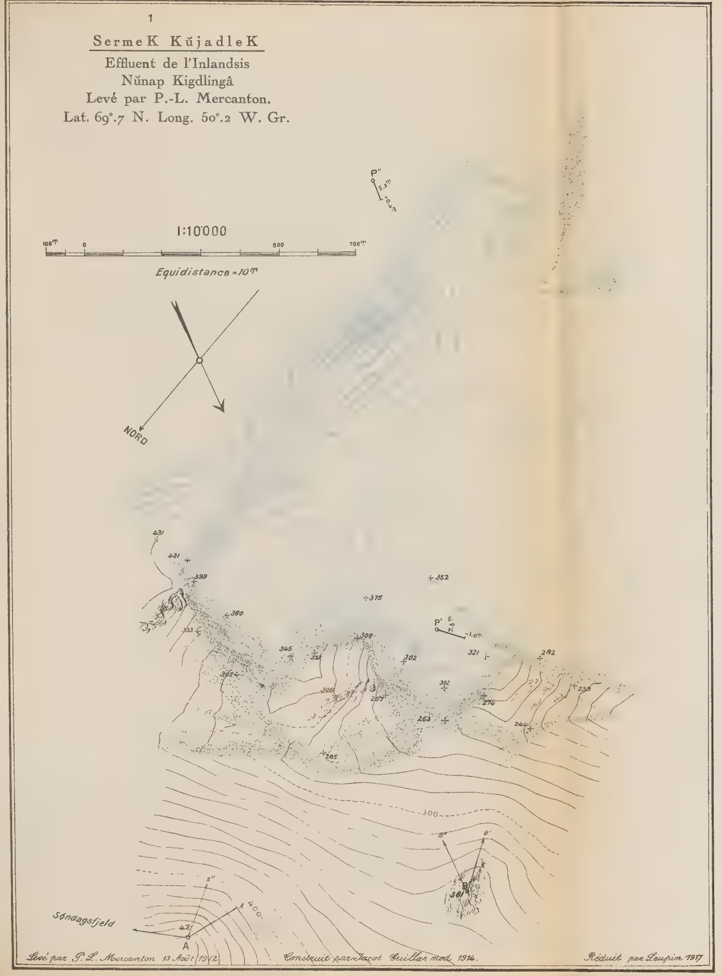


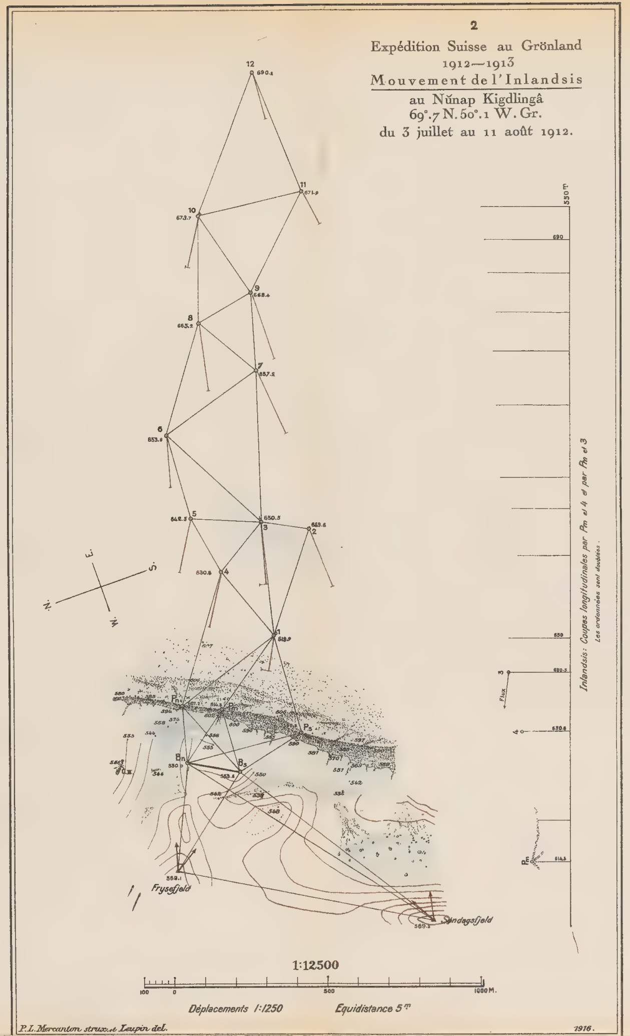


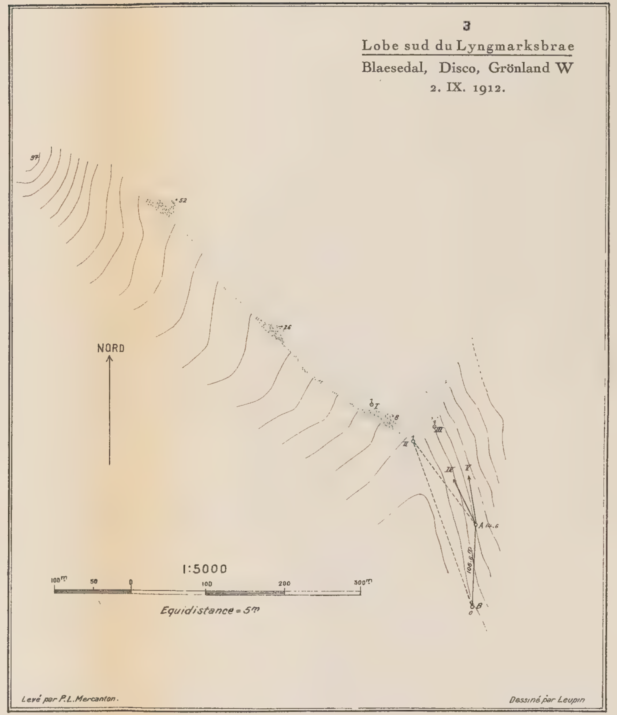
Uebersichtskarte des Ausgangsgebiets an der Westküste und Arbeitsgebiet der Westgruppe.

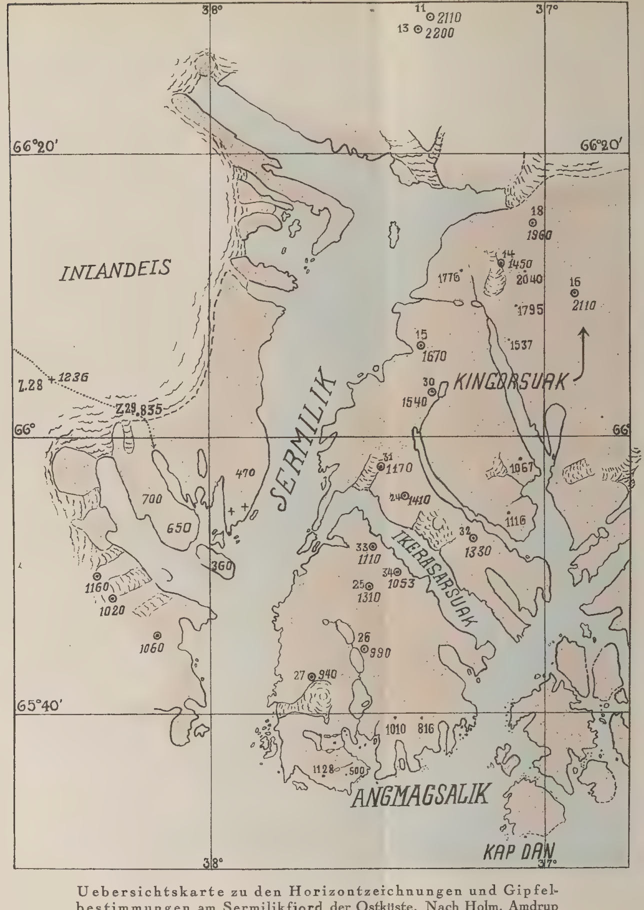
Durchquerungsitinerar der Schweizerischen Expedition 1912
und wahrscheinliches Inlandeisrelief von Mittelgrönland, nach bisherigen Angaben, entworfen von A. de Quervain.
Masstab 1 : 4,000,000; 1 mm = 4 km (Küstenlinien n. d. Karte 1 : 2 Mill. d. dän. geol. Kommission).

gez. E. Schnitter.



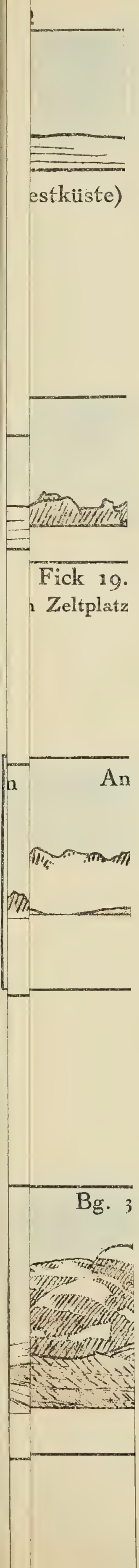






Uebersichtskarte zu den Horizontzeichnungen und Gipfelbestimmungen am Sermilikfjord der Ostküste. Nach Holm, Amdrup und Kruuse. Ergänzt von A. de Quervain. 1 : 500,000.

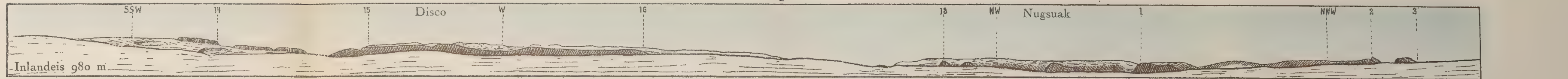
1010 = Höhe n. d. dän. Karte. *1310* = Gipfel des Gebirgshorizontes bestimmt von unsern Zeltplätzen 26, 27, 28, 29 und vom Depot.


estküste)
Fick 19.
Zeltplatz
An
Bg. 3

1

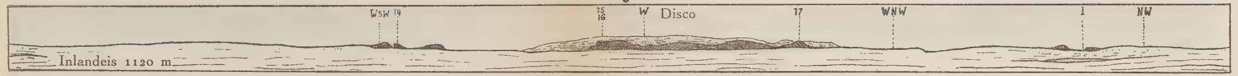
Horizont-Zeichnung vom Inlandeis-Zeltplatz 1 (Westküste) - Gez. v. R. Fick 20. VI. 1912

2



Horizont-Zeichnung vom Inlandeis-Zeltplatz 2 (Westküste) - Gez. v. R. Fick 22. VI. 1912

3

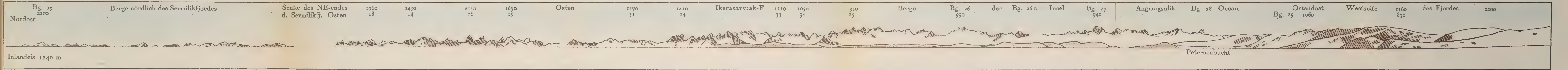


Horizont-Zeichnung vom Inlandeis-Zeltplatz 3 (Westküste) - Gez. v. R. Fick 23. VI. 1912

4

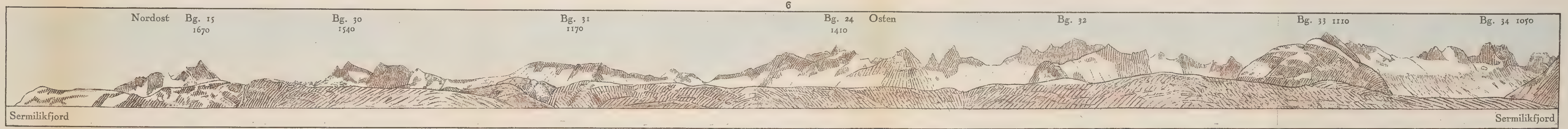
Horizont-Zeichnung vom Inlandeis-Zeltplatz 27 (Ostküste) - Gez. v. R. Fick 19. VII. 1912 (unvollständig wegen Wolkentrübung)
Horizontberge („Schweizerland") vom vorhergehenden Zeltplatz (26) s. auf Kartentafel I.

5



Horizontzeichnung vom Inlandeis-Zeltplatz 28 («Fjordblick», Ostküste) - Gez. v. R. Fick
20. VII. 1912. Vergl. Kartentafel III No. 4 und Text.

6



Horizontausschnitt (gegenüberliegendes Ufer) vom Depotplatz am Sermilikfjord (Ostküste)
Gez. von R. Fick 31. VII. 1912.

IV

FORTEGNELSE

over de af

KOMMISSIONEN FOR
LEDELSEN AF DE GEOLOGISKE OG GEOGRAFISKE
UNDERSØGELSER I GRØNLAND

udgivne

MEDDELELSER OM GRØNLAND

udkommer som Regel 1 Gang aarlig og faas

portofrit tilsendt ved Henvendelse til Hovedkommissionæren

C. A. Reitzel, Boghandel,
Løvstræde 7,
København K.